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THE COMPARATIVE VALUE OF UNCUT, CHAFFED AND GROUND ROUGHAGE FOR FINISHING CALVES

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For many years, mills that were designed to chaff or cut the ordinary farm roughage have been on the market and have been very widely used. When they were first brought out many extravagant statements were made to the effect that the roughage so treated was greatly improved in food value, was more palatable, more easily digested and consequently vastly superior to the uncut material. Gradually, however, it became evident that most of these claims were without foundation, and it was discovered that the real value of the "cutting box", or "chaffer" was mainly in changing the physical condition of the roughage so that it was in a more convenient form for storage and also for feeding either alone or in mixtures. The changed physical condition also had a direct bearing upon waste of material, the cutting or chaffing almost eliminating this important factor. The fact that roughage of poor quality, when chaffed, might be then mixed in any desired proportion with material of better quality proved of very practical importance to the live-stock feeder. It is for these reasons mainly and not on account of any improvement in actual food value of the material that this simple type of machine has become so widely used.

During recent years, however, much publicity has been given to new types of roughage mills. These mills are mostly of the "Hammer type," or "Combination type". The "Hammer type" is based on the "beater system", which simply means that the material, roughage or grain, is beaten into fine particles by coming in contact with beaters revolving at a very high rate of speed. The other type is based on a combination of the use of knives for cutting the material and burrs or plates for crushing and grinding the cut material into meal.

The claims that have been made for these new types of machines have been many, not the least prominent among them being the claim that, on account of the stems of the roughage being crushed and ground into meal, it therefore becomes more easily digested and the animal is able to derive more nourishment from it than was possible when fed in the natural state or even when cut in short lengths, but uncrushed. The theory behind this is that the digestive juices can more easily get at all parts of the material. In some cases, the added claim was made that a mill of this kind made it possible for the roughage and grain to be mixed more perfectly while being ground than at any other time, the inference evidently being

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that the mixture in the case of ruminants would be more thoroughly digested than when fed separately or when the grain ration was fed on top of the cut roughage.

Experiment

To discover if possible just what effect the processing of the ordinary farm roughage had on the value of the feed when used in the feeding of calves being finished for baby beef, the following experiment was planned.

Forty high-grade, range-bred Hereford heifer calves were purchased in late October 1930. They were sorted into four groups known as Lots 1, 2, 3 and 4, and were so selected that each group of ten possessed as nearly as possible equal weight, type, condition and uniformity. The four groups were housed in sheds that were open on the west side and that possessed small outside corrals. All cattle were dehorned with a gouger before the commencement of the experiment. For a few days, only hay and whole oats were fed to the calves; and, on November 13th, the groups were weighed and started on their respective rations.

The grain ration fed to each group was the same in both quality and quantity throughout the experiment. The roughage ration was composed of the same feeds and in the same combinations, but processed differently. The calves in each group received the amount of roughage daily that they would clean up, and all the roughage, including what might be wasted, was charged against them. It will be seen, therefore, that the mechanical state of the roughage was the only variable permitted. The roughage was processed and fed to the calves in the respective lots as follows:

Lot 1—Uncut roughage.

Lot 2—Hammer-type mill (Finely ground).

Lot 3—Combination-type mill (Medium finely ground).

Lot 4—Straw-cutter-type mill (Coarsely chaffed).

The roughage consisted of low-land prairie hay, oat sheaves and legume hay. The grain for the first week consisted of one pound of whole oats per calf divided into two feeds daily. The grain mixture was then changed to include some recleaned screenings and the amount increased gradually. Throughout the experiment, recleaned screenings provided the larger portion of the concentrate mixture. At about six weeks after the commencement, four pounds of grain per calf were being fed; and, at this time, the mixture was made up of three parts screenings and one part of oats. On January 17th, one pound of bran was added to this daily allowance to make a total of five pounds daily. A little oil cake was added to the mixture on February 5th, and continued for the balance of the feeding period. From April 6th on, the cattle were on full feed at ten pounds of grain daily. All groups were fed twice daily, and had access to water and salt at all times. The sheds and yards were kept well bedded and cleaned out at regular intervals.

Feed, power, and labor were priced at the following rates:

Oats	$0.17 per bu.
Recleaned screenings	9.00 " ton

Oilcake	40.00	per ton
Bran	15.00	" "
Oat sheaves	7.00	" "
Grass hay	6.00	" "
Legume hay	8.00	" "
Man labor	.25	" hr.
Belt power	.10	" Kilowatt hr.

The feeding habits of the cattle in the various groups were observed closely. The cattle that were fed on long roughage wasted the largest amount, while those fed on the cutting-box product wasted the least. It was quite evident that the very finely ground roughage was not relished by the cattle. The groups that received finely-ground feed required water at more frequent intervals during feeding time. It was observed, too, that the calves in groups two and three did not remasticate the food for as much of the time as those of groups one and four. On June 1st, the calves had been on feed for exactly 200 days; and, as this is generally accepted as a sufficiently long feeding period, it was decided to conclude the experiment. The calves, therefore, were officially weighed and prepared for shipment to the Winnipeg market.

The table of data will indicate that, in rate of gains and grain requirement per 100 pounds of gain, all groups were very nearly equal. There was a significant difference in the amount of roughage fed to each group. All roughage fed, including what was wasted, was charged against the respective lots, which tended to give Lot 4 an economic advantage and Lot 1 a corresponding disadvantage. Lot 2 has the highest charge against it for power and labor in processing the roughage, and the other lots follow in the order of 3, 4 and 1. There were no charges against Lot 1 for processing roughage.

Finish and Quality

Twelve independent Agricultural authorities passed judgment on the relative quality and finish of the animals in each group; and, of this number, ten gave it as their opinion that there was no difference between the four lots of calves. The buyers agreed that there was no room for discrimination and that all would have to command the same price, which they actually did when sold on the Winnipeg market on June 9th, 1931. Commission men and packer buyers alike expressed very favorable comment about the quality, finish and uniformity of all groups.

The carcases from these cattle were checked very closely on the killing floor and again after they went into the abattoir cool room. They were graded by a committee of four well qualified meat experts eighteen hours after slaughtering; and, of the 40 head, 32 were graded choice (Red brand), and 8 Blue brand. From Lot 1, there were nine graded Red and one Blue; from Lot 2, seven graded Red and three Blue; from Lot 3, seven graded Red and three Blue; and, from Lot 4, nine graded Red and one Blue. While the record of grading would suggest a slight advantage for Lots 1 and 4, it should be pointed out that the entire 40 carcases displayed ex-

ceptional uniformity in all respects. The carcases grading Blue were right on the line between the two top grades, and it could scarcely be said that any one group of carcases excelled another in general finish and quality.

Figure 1. Forty finished calves at the conclusion of the experiment just before loading for market. So uniform were they in type and finish that it was impossible to segregate them into their respective groups except by referring to their identification marks.

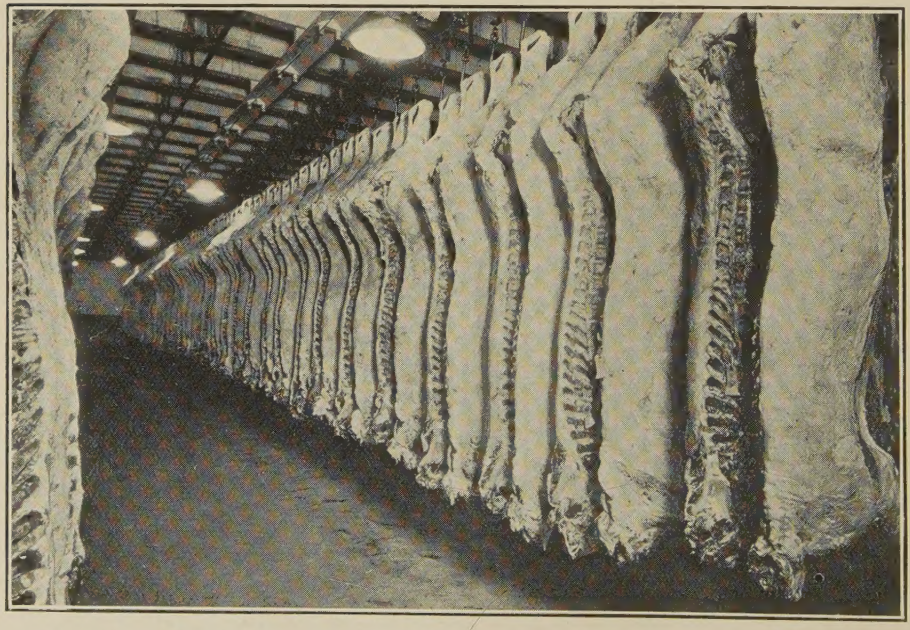

Figure 2. Carcases of the forty calves shown above. Note the uniformity of finish.

TABLE OF DATA

Lot No.	1	2	3	4
Type of grinder	None	Hammer	Combination	Cutting box
Av. wt. of calves Nov. 13, 1930	368.0 lbs.	365.0 lbs.	368.5 lbs.	370.0 lbs.
Av. wt. after 200 days	753.0 "	756.0 "	770.0 "	752.5 "
Av. daily gain per head	1.92 "	1.95 "	2.00 "	1.91 "
Total grain consumed	12832.5 "	12832.5 "	12832.5 "	12832.5 "
Value of grain consumed	$75.28	$75.28	$75.28	$75.28
Grain requirement per 100 lbs. gain	333.31 "	328.19 "	319.61 "	335.49 "
Cost of grain per 100 lbs. gain	$1.96	$1.93	$1.88	$1.96
Total weight of roughage fed	31835.00 "	24821.00 "	25500.00 "	19735.00 "
Total cost of roughage before processing	$110.69	$86.58	$89.61	$69.39
Roughage requirement per 100 lbs. gain	826.88 lbs.	634.81 lbs.	636.61 lbs.	515.95 lbs.
Cost of roughage per 100 lbs. gain (not incl. processing)	$2.87	$2.21	$2.23	$1.81
Total feed cost per 100 lbs. gain (excluding cost of processing roughage)	$4.83	$4.14	$4.11	$3.77
Hours of chaffing or grinding		32 hrs. 19 mn.	38 hrs.	4 hrs. 48 min.
Man hours required in processing		64 hrs. 38 mn.	76 hrs.	9 hrs. 36 min.
Power required in processing (Kilowatt hours)		198.47	112.66	43.96
Cost of power used		$19.85	$11.27	$4.40
Cost of man labor in processing		$16.16	$19.00	$2.40
Cost of power per ton of roughage		$1.60	$0.88	$0.45
Cost man labor per ton roughage.		$1.30	$1.49	$.24
Total feed cost per 100 lbs. gain (incl. cost of processing roughage)	$4.83	$5.06	$4.86	$3.96

DISCUSSION

The very wide spread in amounts of roughage fed to the respective groups warrants some comment and explanation. It is noteworthy that the calves in Lot 1 accounted for approximately 25 per cent more roughage than those in Lots 2 or 3 and that the amount charged against Lot 4 is significantly smaller than for any of the others. The increase in roughage for Lot 1 is due in large part to the tendency on the part of the calves to pull out and trample much of the long or uncut roughage. There was some waste consisting of extremely fine or dusty material left in the mangers in Lots 2 and 3. But this waste would not be sufficient to account for the

difference in the amounts of roughage chargeable to the calves in Lots 4 and either 2 or 3. The respective roughage consumption for these three lots is not in line with total gains made. Another factor probably involving the physiology of digestion would seem to be at work; and, from the results obtained in this case, it would strongly suggest that the digestive system of the ruminant is unable to utilize large quantities of very finely ground roughage with maximum economy.

The practical live stock feeder will look with special interest upon that column which gives the total cost of feed (including cost of processing the roughage) required to make 100 pounds of gain. In this final analysis, Lot 4 stands out with the low cost of $3.96. Lot 1 comes second with a cost of $4.83, Lot 3 is next with a cost of $4.86, and Lot 2 is last in economy of gains with a cost of $5.06 per 100 lbs. of gain.

Directly or indirectly the experiment should indicate the net usefulness of the various types of mills. The extravagant claims made for certain types have not been borne out in this investigation, but a very good case is in evidence for the cutting-box type which has a low first cost and is economical to operate. The product from such a mill is convenient for storage, it facilitates the mixing of feeds, and it eliminates excessive waste. These advantages are probably all that any mill can boast, and surely such important factors as first cost or overhead, up-keep, power requirement, and speed of operation are not to be overlooked.

Conclusion

The results obtained in the foregoing experiment seem to justify the following comment thereon:

1. That the greatest amount of waste is to be expected when long roughage is fed.
2. That, if this waste could be controlled by specially equipped mangers and feed racks, it would seem that the processing of roughage is of very doubtful value.
3. That the very fine grinding of roughage tends to lower its palatibility.
4. That the need of continual access to water is increased when cattle are eating finely ground feeds.
5. That remastication is materially reduced when finely-ground roughage is fed.
6. That, in rates of gain and total gains for the lots in this experiment, the differences are barely significant.
7. That the cattle receiving the chaffed roughage (Lot 4) showed a substantial saving in cost of feed required to make 100 lbs. of gain.
8. That, when the cost of processing the roughage was included for all groups, the saving in cost of gains was still more favorable for Lot 4.
9. That there was no apparent difference in quality or finish of the four groups of calves at the conclusion of the investigation.
10. That there was no significant difference in the quality of the carcases as studied after slaughtering, although the record of grading would suggest a slight difference in favor of groups 1 and 4.

11. That, from the results obtained in this experiment, it would appear that there is no advantage in the grinding of roughage to a very fine state for finishing calves.

ACKNOWLEDGEMENTS

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VARIETAL MIXTURE IN COMMERCIAL WHEAT AND ITS EFFECT ON MILLING AND BAKING QUALITY[1]

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INTRODUCTION

In 1927 and 1928 the milling and baking qualities of Canadian hard red spring wheat averaged less high than usual. While it was fairly apparent to the wheat experts of the Provinces that this disturbance of quality was largely the result of unusually unfavorable environmental conditions experienced during the harvest seasons of both 1927 and 1928, many people concluded that the change in quality was at least partly due to an increasing amount of varietal mixture in Western Canadian wheat. There was considerable difference of opinion on the amount and place of mixing of wheat varieties in commercial shipments as well as on the effect of this mixing upon the milling, baking and blending values of the mixtures.

In view of these circumstances and of the fact that there was insufficient evidence available either to disprove or to verify the popular notions respecting varietal mixture, the Western Canadian Society of Agronomy at its annual meeting on December 29, 1928, passed a resolution that the society undertake to arrange a cooperative investigation to determine: "1. The amount and kind of mixing of wheat varieties taking place at (a) the farms, (b) the country elevators, (c) the terminal elevators, and (d) the transfer and ocean port elevators; 2. the milling and baking quality and the blending value of these mixtures in comparison with pure varieties." An organization committee was appointed to arrange for the investigation. This committee[3] drew up a working basis for the investigation and appointed an inter-provincial committee[4] to succeed it and get the investigation started. Owing to circumstances it was impossible for Alberta to participate in the study, and eventually a working committee was formed with Mr. H. S. Fry as Chairman. This committee had two sections, one

[1] An investigation started under the auspices of the Western Canadian Society of Agronomy and conducted cooperatively by the Dominion Experimental Farms, the Universities and the Wheat Pools of Saskatchewan and Manitoba, and a Manitoba official of the Dominion Seed Branch.

[2] Professor of Field Husbandry, University of Saskatchewan, Saskatoon. The following grew the samples and identified the individual plants as to variety: W. J. Breakey, Ass't. Supt. Dominion Experimental Farm, Morden, Man.; T. Coltart, Dom. Seed Branch, Winnipeg; J. G. Davidson, Ass't. Supt. Dom. Experimental Farm, Indian Head, Sask.; A. T. Elders, Prof. of Field Husbandry, University of Manitoba, Winnipeg; F. V. Hutton, Ass't. Supt., Dom. Experimental Farm, Rosthern, Sask.; H. J. Kemp, Ass't Supt. Dom. Experimental Farm, Swift Current, Sask.; F. M. McIsaac, Ass't Supt. Dom. Experimental Farm, Scott, Sask.; G. D. Matthews, Supt. Dom. Experimental Farm, Scott, Sask.; S. J. Sigfusson, Ass't. Supt. Dom. Experimental Farm, Brandon, Man.; J. G. Taggart, Supt. Dom. Experimental Farm, Swift Current, Sask.; M. J. Tinline, Supt. Dom. Experimental Farm, Brandon, Man. Mr. H. S. Fry, Director of Publicity, Saskatchewan Cooperative Wheat Producers Limited, Regina, Sask., made the preliminary coordination and analysis of the data. The following conducted the milling and baking tests: W. F. Geddes, Professor of Agricultural Chemistry, University of Manitoba, Winnipeg; R. K. Larmour, Professor of Chemistry, University of Saskatchewan, Saskatoon; A. G. McLeod, Cereal Chemist, Canadian Cooperative Wheat Producers, Ltd., Winnipeg. The following were helpful in furthering the investigation: J. E. Blakeman, Dominion Seed Branch, Winnipeg; A. Cairns, Director of Statistics and Research, Canadian Wheat Pools, Winnipeg; T. J. Harrison, Ass't. Commissioner, Board of Grain Commissioners, Winnipeg. Thanks are due also to those who assisted with the nursery work and tabulating.

[3] Personnel of committee: T. J. Harrison (Chairman), O. S. Aamodt, H. S. Fry, J. B. Harrington, L. E. Kirk, M. J. Tinline.

[4] J. B. Harrington (Chairman) for Saskatchewan, W. H. Fairfield for Alberta, and T. J. Harrison for Manitoba.

for Manitoba[5] and one for Saskatchewan[6]. These two sub-committees completed the details of the plans outlined by the organization committee.

The final working basis agreed upon may be summarized as follows:

1. Conditions: (a) Only spring sown wheats to be considered.
   (b) Uniform methods to be used in both provinces.
   (c) Results to be so obtained as to be separately compilable for each province.
2. Scope: (a) The amount, place and nature of varietal mixing to be studied.
   (b) The milling and baking quality of representative varietal mixtures to be determined.
3. Procedure: (a) Representative samples to be collected from seed drills, wagon loads as delivered to country elevators, carloads entering terminals, grain loaded out of terminals and ocean cargoes to a total number of about 1000.
   (b) The samples to be grown, the varieties identified and the amount and nature of the admixture varieties determined.
   (c) Pure seed of all varieties found in the samples to be grown under comparable conditions and synthetic mixtures made to approach as nearly as possible the actual mixtures found.
   (d) Strictly comparable milling and baking tests to be made on progeny from the pure varieties and the synthetic mixtures.
   (e) The data to be analysed and summarized to show the results of the investigation.

After the samples had been grown and analysed as to varietal constitution, and after the milling and baking tests had been made, the data was summarized and the chairman of the two provincial working committees, in the limited amount of time available before the next annual meeting of the Western Canadian Society of Agronomy (December 1929), prepared a preliminary report. The report was presented at that meeting by Mr. Fry. The society showed considerable interest in the results and gave the Executive power to act respecting a more complete analysis of the data. The executive favored further analysis, to be reported on at the meeting of December 1930, and appointed for this purpose a committee with Dr. J. B. Harrington[7] as chairman. This committee met in January 1930, outlined a procedure, and left the analysis of the data with the chairman. The chairman presented the results of this analysis of the data at the December 1930 meeting of the W.C.S.A. At that meeting it was suggested that the results be published, and this suggestion was later approved by the various investigators who had taken part in the work.

[5]The Manitoba Committee consisted of: M. J. Tinline (Chairman), J. E. Blakeman, C. H. Burnell, A. Cairns and W. J. Breakey.

[6]The Saskatchewan committee consisted of: H. S. Fry (Chairman), J. G. Davidson, F. V. Hutton, H. J. Kemp, F. M. McIsaac, G. D. Matthews, S. H. Vigor and J. B. Harrington.

[7]Personnel of committee: J. B. Harrington (Chairman), H. S. Fry, R. K. Larmour, A. G. McLeod and K. W. Neatby.

Procedure

The investigation was commenced by the collecting of samples. Considerable thought was put on this matter in order that the number of samples collected and the manner of collection would give representative lots of material for the further work. The seed drill samples were secured at the time of seeding by the Dominion Seed Branch in Manitoba and by the field service representatives of the Saskatchewan Wheat Pool in Saskatchewan. The samples of grain delivered by farmers to country elevators were secured in Saskatchewan by Saskatchewan Pool Elevators, Ltd., the number from different districts being based upon the quantity of wheat produced in those districts. Country elevator samples were obtained in Manitoba in a similar manner by Manitoba Pool Elevators, Limited. Samples of grain unloaded into terminal elevators were collected by means of the automatic samplers installed in Wheat Pool terminals, and were representative of individual carloads of wheat. Samples of grain loaded out of terminals were secured by the Canadian Wheat Pool from Pool Terminal Elevators at the head of the Great Lakes and at Vancouver. The ocean cargo samples were also collected by the Canadian Wheat Pool from cargoes unloaded in United Kingdom ports. All samples used in the investigation were from the 1928 crop as far as is known. The ocean cargo samples and most of the terminal samples were taken from grades 3° and 4° because these represented the average grade of the 1928 crop more nearly than any of the others.

It was decided, with respect to the seed drill, country elevator and terminal inturn samples, that the Saskatchewan samples should be distributed to the Dominion Experimental Farms of Saskatchewan and the Manitoba samples to the Dominion Experimental Farms of Manitoba and the Manitoba Agricultural College for growing and progeny identification. The terminal outturn and ocean cargo samples, not having, of course, any definite identity as to provincial source, were distributed at random to the Manitoba and Saskatchewan committees. The method of distribution of the samples to the experiment stations was not the same in the two provinces. In the discussion of the data this point will be fully considered. The Dominion Experimental Farm at Scott, Saskatchewan, undertook the growing of the pure varieties for the synthetic mitxures in addition to their share of the samples. The distribution of samples was made to the following Dominion Experimental Farms: Indian Head, Rosthern, Scott, Swift Current in Saskatchewan; Brandon and Morden in Manitoba; the Manitoba Agricultural College at Winnipeg, as shown in table 1.

The samples were sown in rod row plots consisting of at least two rows. In most cases five row plots were grown and a minimum of 200 plants taken at random were identified. At some of the experimental stations all of the plants grown were identified. The identification as to variety was made by the cerealists at the various stations. This involved a tremendous amount of painstaking work. For example, at one of the experimental farms approximately 96,000 individual plants were examined. Wherever possible plants were identified as belonging to some named variety, otherwise they were classed as miscellaneous.

TABLE 1.—*Source of samples and their distribution with respect to varietal analysis.*

Origin of samples	Total No. of samples	Rosthern	Indian Head	Swift Current	Scott	Sask.	Wpg.	Bran.	Morden	Man.
Seed drill	209	114				114	28	39	28	95
Local elev.	234		170			170	31	13	20	64
Ter. inturn	278			199		199	14	33	32	79
Ter. outturn	70				50	50	7	7	6	20
Ocean cargo	100				50	50	15	19	16	50
Totals	891	114	170	199	100	583	95	111	102	308

Before the results were tabulated it was desirable to group the varieties according to their milling and baking quality, since it was obviously impossible to mill and bake samples representative of all the hundreds of possible varietal combinations. After much work the two sub-committees agreed upon a definite grouping of the varieties upon the basis of their milling and baking quality and their market classification. The grouping of the varieties is shown in table 2. It was recognized that this grouping was by no means perfect, yet it was important to keep the number of groups down to a practical minimum. The inclusion in Group 1 of varieties that ripen two weeks apart might be severely criticized. In fact, the original grouping divided the varieties in Group 1 into two sub-groups, one comprising the very early maturing wheats Reward and Ruby, and the other the remaining varieties. However, the actual samples showed that appreciable mixtures of very early varieties with later varieties rarely occur in farmers' fields. It might also be argued that even a mixture such as Marquis and Renfrew might be decidedly undesirable. There again the data show that such mixtures, while possible, were actually rare. Consequently further objection to this grouping becomes academic rather than practical. Descriptions of the varieties listed in table 2 and the results of recent studies on the purity and quality of some of the more prominent ones will be found in the bulletins and papers listed under "References" at the end of this report.

TABLE 2.—*Grouping of varieties on the basis of milling and baking quality and market classes.*

I. *High quality red spring*
- Marquis
- Red Bobs
- Red Fife
- Kitchener
- Early Red Fife
- Renfrew
- Ceres
- Supreme
- Early Triumph
- Reward
- Ruby

II. *Medium quality red spring*
- Garnet
- Preston
- Huron
- Stanley
- Pioneer
- Whitehead

III. *White Wheat*
- Quality
- Axminster
- White Fife

IV. *Red spring of odd quality*
- Parker's selection
- Marquillo
- Kota

V. *Wheats of poor quality*
- Vermilion
- Brownhead
- Ladoga
- Club
- Miscellaneous

VI. *Durum wheat*

It was decided that samples containing 50 percent or more of plants of a given variety would be classified as that variety. (Actually only five of the 891 samples showed a variety purity under 60 percent).

After the individual plant identification of the sample progenies had been completed, the results were summarized and a meeting held to determine exactly what varietal mixtures were to be given milling and baking tests. It was agreed that the most prevalent mixtures appearing in the cargo samples should be used as a basis for making up artificial mixtures from the pure variety material grown at the Scott Experimental Farm. The drawing up of a representative series of type mixtures was greatly facilitated by the fact that Marquis constituted the bulk of 80 percent of the samples. That is, where mixtures occurred they nearly always consisted largely of Marquis. Therefore Marquis, representing variety group I, was selected as the foundation stock of all of the type mixtures. A representative variety was selected from each of the other groups as follows: Group II, Garnet; Group III, Quality; Group IV, Parker's Selection; Group V, Ladoga; Group VI, Mindum. From the material grown at the Scott station fifteen-pound composite samples (type mixtures) were made up as shown in table 3. Doubtless it would have proven more satisfactory to have made up composites containing aliquot portions of all varieties in each group, but the labor involved was considered too great for such a preliminary survey.

TABLE 3.—*The "type mixtures" for milling and baking tests of representative mixtures that actually occur.*

Mixture No.	Group	%	Group	%	Mixture No.	Group	%	Group	%
T 1	I	100			T 14	I	90	5	10
T 2	I	90	2	10	T 15	I	80	5	20
T 3	I	80	2	20	T 16	I	70	5	30
T 4	I	70	2	30	T 17	I	60	5	40
T 5	I	60	2	40	T 18	I	90	6	10
T 6	I	90	3	10	T 19	I	80	6	20
T 7	I	80	3	20	T 20	I	70	6	30
T 8	I	70	3	30	T 21	I	60	6	40
T 9	I	60	3	40	T 22			2	100
T 10	I	90	4	10	T 23			3	100
T 11	I	80	4	20	T 24			4	100
T 12	I	70	4	30	T 25			5	100
T 13	I	60	4	40	T 26			6	100

The 15-pound samples thus made were subdivided into three 5-pound samples and these were sent to the University of Saskatchewan, the University of Manitoba and the Canadian Wheat Pool wheat testing laboratories for milling, baking and analytical tests. Each laboratory milled and analyzed the samples and baked the flours by the standard baking method. In addition to this baking test, each laboratory conducted a second baking test. The baking methods used were: at Saskatchewan, the blend-bromate test; at Manitoba, the standard formula + 1% panomalt; at the Pool Laboratory, the standard

formula + 0.001% $KBrO_3$. In the blend-bromate formula, a mixture of 40% English wheat flour and 60% flour under test was baked by the bromate formula.

TABLE 4.—*The varietal constitution of a few representatives of the 891 samples that were given a progeny test.*

Variety (Sample No.)	Proportion of Plants in Percent												
	Seed Drill Samples								Ocean cargo samples				
	1	2	265	137	119	169	219	67	10	39	19	25	9
Group I.													
Marquis	97.4	99.6	91.2	100.0		98.0	0.7	98.0	85.5	58.1	94.4	89.6	92.5
Red Bobs									1.8			1.3	
Red Fife	1.4								0.9	3.7		0.8	
Kitchener										2.8			2.5
E. Red Fife		0.4							3.6	1.9		1.2	
Renfrew													
Ceres													
Supreme										6.4			
E. Triumph													
Reward													
Ruby										2.5			
Group II.													
Garnet					99.1				0.9	7.7		3.4	
Preston						0.4			0.9	1.0		0.3	
Huron			0.8			1.2		2.0		1.9	1.6	0.3	5.0
Stanley			0.8			0.4			1.2	1.0	1.6	0.6	
Pioneer													
Whitehead													
Group III.													
Quality	0.4												
Axminster													
White Fife													
Group IV.													
Parker's Sel.			0.4										
Marquillo													
Kota			1.6		0.6					8.2	2.4	0.3	
Group V.													
Vermilion													
Brownhead													
Ladoga			3.6		0.3				4.5	0.9		1.9	
Club													
Miscellaneous	0.8		1.2							2.0			
Group VI.													
Durums			0.4				99.3		0.7	1.9		0.3	
Total number of plants	247	237	240	251	365	271	300	214	315	217	250	325	201

RESULTS

An illustration of the data as tabulated at each station upon the completion of the identification work is given in table 4. The few samples shown in the table were taken at random from the seed drill and ocean cargo data sheets and constitute approximately one percent of the total amount of data obtained.

Table 5 gives the relative importance of the different varieties by showing the total proportion of each variety in all of the samples taken collectively according to class of origin. For example, Marquis comprised 78.05 percent of the Saskatchewan seed drill samples considering all of them as one large sample. The three other most prominent varieties in the Saskatchewan seed drill group of samples were Garnet 8.78%, Red Bobs 3.4% and Huron 2.33%. The Manitoba S.D. (seed drill) samples considered similarly showed the following prominent varieties: Marquis 43.91%, Mindum 19.69%, Garnet 18.55%, Parker's Selection 5.42%, Axminster 2.23% and Quality 2.13%. In general the distribution of varieties in the S. D. samples was similar to that in the C. E. (country elevator) samples, excepting that the amount of Garnet identified in the Manitoba material decreased from the high percentage of 18.55 to 8.12. The proportion of durum wheat in the Manitoba S. D. and C. E. samples was high (22.5% and 22.38%).

The T. O. (terminal outturn) and O. C. (ocean cargo) samples were high in the proportion of Marquis, averaging 85.11% and 82.15%, respectively. In the table the results from Saskatchewan and Manitoba stations are averaged. There was no object in keeping them separate since any T.O. or O.C. sample was as likely to be a mixture of wheat from all three Prairie Provinces as from any one of them. The very low amount of white wheats in these samples may be attributed to the fact that white wheats are not generally exported from Canada. The negligible amount of durums in the O.C. samples is due to no durum cargoes being sampled. This investigation was limited, as far as export trade is concerned, to the grades of common hard red spring wheat, since the original criticism of the quality of Western Canadian wheat was directed at those grades, and it is they that constitute the bulk of Canada's wheat export.

The importance of each variety group was ascertained by summarization of data by variety groups, as shown in table 5. Considering the classes most concerned with export trade the proportion of high quality wheats was 91.75% in the T. O. samples and 90.04% in the O.C. samples. The combined percentages of medium, odd and low quality red wheats (see last line of table 5) were: 8.16% for the T.O. samples and 8.33% for the O.C. samples. The combined percentages of durum and white wheats for both T.O. and O.C. samples averaged 0.36%.

It is also of interest to examine the distribution of samples according to the variety predominating in each. This is shown in table 6. There were 891 samples, of which 720 proved to be Marquis. A further 50 samples were of other Group I varieties. Garnet was represented by 52 samples. There was one sample representing Groups III, IV, V and VI in the Saskatchewan material and 63 in the Manitoba material. Forty-two of the latter were durums.

Reliability of the Variety Identification Data. The basis of the distribution of samples in Saskatchewan and Manitoba differed, as was shown in table 1. Having all the seed drill samples handled at one station, all the local elevator samples at another, etc., as was done in Saskatchewan,

TABLE 5.—*The proportion of each variety identified in all of the samples, the samples of each class of origin being considered as one large sample.*

Group and Variety	Proportion of Plants in Percentage							
	Seed drill		Country Elevator		Terminal Inturn		Terminal Outturn	Ocean Cargo
	Sask.	Man.	Sask.	Man.	Sask.	Man.		
Group I.								
Marquis	78.05	43.91	78.41	44.94	78.24	67.13	85.11	82.15
Red Bobs	3.40	.01	.10	.61	.40	.01	1.32	1.08
Red Fife	1.06	.14	1.91	.31	8.45	1.74	.99	1.70
Kitchener	.12		.35	.01	.71	.08	.25	.44
Early Red Fife	1.51	.20	4.82	1.51	5.03	.13	.71	.83
Renfrew	.08					.08	.27	.23
Ceres	.89	.17	.12	.35		.35	.11	.05
Supreme		.04		.21	.08	.14	.44	1.64
Early Triumph		.08		.01		.02	.04	.48
Reward		2.14	.02				.01	
Ruby		.01	1.91	4.49	.05	4.73	2.50	1.44
Total	85.11	46.70	87.64	52.44	92.96	74.38	91.75	90.04
Group II.								
Garnet	8.78	18.55	7.42	8.12	1.26	9.25	2.16	2.94
Preston	.47	.26	1.15	1.04	.46	.25	.44	.49
Huron	2.33	.58	.04	3.83	.09	1.98	.90	1.65
Stanley	1.28	.24	.17	1.77		.62	.64	1.24
Pioneer					.03			.01
Whitehead					.02			
Total	12.86	19.63	8.78	14.76	1.86	12.10	4.14	6.43
Group III.								
Quality	.88	2.13	.01	3.80		.08	.01	.13
Axminster		2.23		1.47		1.21	.01	.49
White Fife							.01	
Total	.88	4.36	.01	5.27		1.29	.03	.62
Group IV.								
Parker's Selection		5.42		1.51		4.88	.40	.07
Marquillo				.09			.01	.01
Kota	.25	.63	3.49	3.40	.64	1.16	1.49	.74
Total	.25	6.05	3.49	5.00	.64	6.04	1.90	.82
Group V.								
Vermilion							.01	
Brownhead			.08		.02		.12	.07
Ladoga		.43		.15	4.23	.61	1.55	1.17
Club	.01			.02			.09	.04
Miscellaneous	.89	.33		.45	.28	.82	.35	.49
Total	.90	.76	.08	.62	4.53	1.43	2.12	1.77
Group VI.								
Mindum		19.69		21.50	.01	4.76	.06	.30
Kubanka		2.81						
Acme				.88				
Total		22.50		22.38	.01	4.76	.06	.30
Total for groups II, IV and V*	14.01	26.44	12.35	20.38	7.03	19.57	8.16	8.33

*These groups combined comprise the hard red spring varieties of more or less inferior quality.

TABLE 6.—*Distribution of samples according to the variety predominating in each.*

Group and Variety	No. of samples		Group and Variety	No. of samples	
	Sask.	Man.		Sask.	Man.
Group I.			*Group III.*		
Marquis	521	199	Quality	1	5
Red Bobs	5		Axminster		5
Red Fife	15	1	White Fife		
Kitchener	1		Total	1	10
Early Red Fife	11				
Renfrew					
Ceres	1		*Group IV.*		
Supreme			Parker's Selection		10
Early Triumph			Marquillo		
Reward		2	Kota		1
Ruby	3	11	Total		11
Total	557	213			
			Group V.		
Group II.			Vermilion		
Garnet	23	29	Brownhead		
Preston	1		Ladoga		
Huron	1	2	Club		
Stanley	1		Miscellaneous		
Pioneer			Total		
Whitehead					
Total	26	31	*Group VI.*		
			Durums		42

might superficially be considered to invalidate comparisons between the different kinds of samples. It was therefore necessary to analyze the data first from the viewpoint of reliability. This was done on the basis of individual varieties and then on that of variety groups. The Manitoba data were used, for the samples of each class were divided at random among three different stations, thus affording direct comparisons of the results.

The analysis indicated that the variety identification was usually, but not always, correct. There was no question but that Kitchener and Ruby were occasionally mistaken for Marquis, and vice versa. This was to be expected since the morphological differences between individual plants of these varieties are not great and are often masked by environmental effects. Fortunately, these three varieties all belong to the group of high quality wheats. Preston and Kota were confused not infrequently. Similarly, Huron and Ladoga were taken for each other. In both of these pairs of varieties the most obvious difference is a matter of beak length. Since Preston is notoriously impure and Ladoga quite variable in beak length, an accurate identification of a particular plant is often impossible. None of the four varieties belong to Group I, and all of them rank as hard red spring wheats of inferior or peculiar quality. One of the three Manitoba stations consistently identified more varieties than did the other two. Much of this difference consisted of small proportions, usually under one percent, of uncommon varieties. This can hardly be regarded as a vital weakness in the identification work of any of the stations, for the effect on quality of small proportions of the less used varieties is not im-

portant. Serious inaccuracy in the classification work appeared to be infrequent, but the advisability of summarizing the data on a variety group basis was evident.

TABLE 7.—*Analysis of group purity of samples as obtained at each experiment station.*

Origin of Samples	No. of samples	No. of Group I Samples	Percentage purity of Group I samples
I. Seed Drill			
Winnipeg	28	18	96.82
Brandon	39	17	97.35
Morden	28	11	98.04
Manitoba (mean)	95	46	97.31
Rosthern, Sask.	114	98	98.22
II. Country Elevator			
Winnipeg	31	27	89.38
Brandon	13	4	93.46
Morden	20	4	90.15
Manitoba (mean)	64	35	89.93
Indian Head, Sask.	170	158	93.20
III. Terminal Inturn			
Winnipeg	14	6	93.77
Brandon	33	28	92.14
Morden	32	29	92.09
Manitoba (mean)	79	63	92.54
Swift Current, Sask.	199	198	93.26
IV. Terminal Outturn			
Winnipeg	7	7	89.32
Brandon	7	7	87.23
Morden	6	6	93.04
Manitoba (mean)	20	20	89.70
Scott, Sask.	50	50	92.80
V. Ocean Cargoes			
Winnipeg	15	15	92.85
Brandon	19	18	88.51
Morden	16	16	90.84
Manitoba (mean)	50	49	90.57
Scott, Sask.	50	50	92.15

Perhaps the best practical test of the reliability of the varietal identification work is a comparison of the group purity percentages obtained at the three Manitoba stations. The number of samples for groups other than Group I was too small to be of value in this regard. The results on the Group I samples are given in the first three lines of each section of table 7. They are sufficiently similar in each section to warrant the conclusion that the varietal identifications made at one station were essentially the same as those made at the others as far as variety groups are concerned. Furthermore, the last two lines of each section of the table show that the average of the Manitoba samples of each class was very similar to that of the Saskatchewan samples. The table 7 results show clearly that the difference in method of apportionment of samples in the two provinces did not appreciably detract from the value or accuracy of the varietal identification work, and that the data, therefore, could be analyzed as though the same method had been used in each province.

Analysis of the Purity of Group I Samples. The hard red spring sown varieties of high milling and baking quality (Group I) are of far more importance to Canada than all the others combined. It is fitting, then, to examine first the constitution of this group of varieties to ascertain the legitimacy of handling it as a group rather than to split it up into several groups. If, for example, a large proportion of Group I Seed Drill or County Elevator samples consisted of mixtures including approximately equal amounts of Marquis and Ruby, it is conceivable that the farmers would have harvested their fields before the Marquis was properly mature in order not to lose too much of the earlier ripening variety through shattering. This might mean wheat of somewhat lower grade than a similar mixture of varieties that ripen at approximately the same time, as Marquis and Red Bobs.

However, the actual results as given in table 8 show that such mixtures were practically non-existent. There were 98 Seed Drill samples from Saskatchewan, of which 91 were Marquis with an average purity of 96.63%, and seven were other varieties with an average purity of 91.93%. There were 46 Seed Drill samples from Manitoba, of which 44 were Marquis with an average purity of 78.04%, and two were very early wheat with an average purity of 99%. Similarly, the results for Country Elevator samples of Group I show high average purity (nothing under 81.87%) which would not have been possible if even a few samples had consisted of bad mixtures (such as 50% Marquis, 45% Ruby, 5% others). Even the Terminal Inturn, Terminal Outturn and Ocean Cargo samples of Group I showed relatively high purity when considered on the critical basis of the sub-groups of Group I.

In concluding the discussion of table 8 results, it may be stated that the placing of all of the high quality varieties in one group, while theoretically open to criticism, did not obscure any unfavorable mixtures within the group, since such mixtures were practically non-existent. Furthermore, this placing of all of the high quality varieties in the same group greatly facilitates a lucid presentation of the results.

Summary of the purity of Group I Samples. In presenting the results on the purity of samples in each group (tables 9 - 12) varieties of groups II, IV, and V are thrown together in one group in order to reduce the data to its more essential features. These groups contain all of the hard spring wheats of more or less inferior milling, baking and blending quality and in addition some miscellaneous wheats that are of very little importance in Western Canada, and seldom grown. It was felt that retention of the identities of the three groups greatly complicated the presentation of the data without adding a compensating value to the results.

The results on Group I are given in table 9. Probably the most significant features of these results are: (1) the very high purity throughout, averaging 92.97%; (2) the distinct drop in purity from the Seed Drill to the Country Elevator samples, being 5.02% for Saskatchewan and 7.38% for Manitoba; and (3) the absence of an appreciable drop in purity between the Country Elevator and the Ocean Cargo samples. The average drop was 0.21%.

TABLE 8.—*Analysis of the purity of Group I samples from the viewpoint of group constitution.*

Origin of samples	Number of samples	Percent purity as a group	Three General Sections of the Group					
			Marquis		Reward & Ruby*		Other varieties	
			No. of samples	Percent purity	No. of samples	Percent purity	No. of samples	Percent purity
I. Seed Drill								
Saskatchewan	98	98.22	91	96.63	–	–	7	91.93
Manitoba	46	97.31	44	78.04	2	99.00	–	–
II. Country elevators								
Saskatchewan	158	93.20	151	87.26	3	83.67	4	81.87
Manitoba	35	89.93	31	87.63	3	94.60	1	93.00
III. Terminal inturn								
Saskatchewan	198	93.26	176	84.54	–	–	22	66.58
Manitoba	63	92.54	56	89.10	6	80.27	1	79.00
IV. Terminal outturn								
Saskatchewan	50	92.80	50	82.40	–	–	–	–
Manitoba	20	89.70	18	82.73	2	89.55	–	–
V. Ocean Cargoes								
Saskatchewan	50	92.15	50	77.21	–	–	–	–
Manitoba	49	90.57	47	76.29	2	73.97	–	–

*Very early maturing varieties.

TABLE 9.—*Summary of the purity of samples of Group I, the hard red spring wheats of high milling and baking quality.*

Origin of samples	No. of samples	Total Percentage of Plants of				
		High qual. red seeded vars. (Gr.1)	Inferior red seeded varieties	White seeded varieties	Durum varieties	Combined admixtures
I. Seed Drill						
Saskatchewan	98	98.22	1.78	–	–	1.78
Manitoba	46	97.31	2.49	.01	.19	2.69
II. Country Elevator						
Saskatchewan	158	93.20	6.79	.01	–	6.80
Manitoba	35	89.93	9.42	.09	.56	10.07
III. Terminal inturn						
Saskatchewan	198	93.26	6.21	.52	.01	6.74
Manitoba	63	92.54	7.18	.12	.16	7.46
IV. Terminal outturn						
Saskatchewan	50	92.80	7.10	.03	.07	7.20
Manitoba	20	89.70	10.30	–	–	10.30
V. Ocean Cargoes						
Saskatchewan	50	92.15	7.59	.15	.11	7.85
Manitoba	49	90.57	9.09	.07	.27	9.43

Results on the samples of Groups II, IV and V, the red spring varieties of quality inferior to that of Group I, are given in table 10. Admixture, consisting of durums and white seeded varieties, was negligible excepting in the case of country elevator samples from Manitoba, where it averaged 9%.

TABLE 10.—*Summary of the purity of samples of Groups* II, IV *and* V, *collectively—the red spring wheats* of quality inferior to that of Group* I.

Origin of samples	Number of samples	Total Percentage of Plants of		
		Varieties of Groups 1†, 2, 4, 5	White seeded varieties	Durum varieties
I. Seed Drill				
Saskatchewan	14	100.00	—	—
Manitoba	22	99.60	.33	.07
II. Country Elevator				
Saskatchewan	12	100.00	—	—
Manitoba	11	91.00	4.32	4.68
III. Terminal Inturn				
Saskatchewan	1	100.00	—	—
Manitoba	11	99.74	.06	.20

NOTE: There were no group II, IV or V samples in the terminal outturns and ocean cargoes.

*Including samples of club wheat.

†Group 1 wheats were included as they cannot be considered an impurity from the standpoint of export quality.

The results on samples of white wheat are given in table 11. The number of samples was very small, owing to the low acreage of white wheat grown in Western Canada. On the whole the purity was very high, averaging above 96% excepting for the one cargo sample, which was 78.8%.

TABLE 11.—*Summary of the purity of samples of Group* III, *the white wheats.*

Origin of samples	Number of samples	Total Percentage of Plants of				
		White seeded varieties	Varieties of Group 1	Varieties of Groups 2, 4, and 5	Varieties of Group 6	Combined admixtures
I. Seed Drill						
Saskatchewan	2	99.00	.50	.50	—	1.00
Manitoba	5	98.18	.90	.92	—	1.82
I. Country Elevator						
Manitoba	3	94.15	1.37	4.31	.17	5.85
III. Terminal Inturn						
Manitoba	1	95.80	—	4.20	—	4.20
V. Ocean Cargoes						
Manitoba	1	78.80	14.10	7.10	—	21.20

All of the durum samples came from Manitoba, there being practically no durum wheat raised in Saskatchewan. The results as given in table 12 show an average purity well above 90% and a drop of about 3% between

the Seed Drill and the Country Elevator samples. It is of interest that there was less than 0.05% of white wheat mixed with the durum.

TABLE 12.—*Summary of the purity of samples of Group* VI, *the durum wheats.*

Origin of samples	Number of samples	Total Percentage of Plants of				
		Durum varieties	Group 1 varieties	Varieties of Grs. 2, 4 & 5.	Varieties of Group 3	Combined admixtures
I. Seed Drill Manitoba	22	94.91	1.94	3.11	.04	5.09
II. Country Elevator Manitoba	15	91.83	2.97	5.16	.04	8.17
III. Terminal inturn Manitoba	4	91.88	4.97	3.15	—	8.12

Milling and Baking Tests. Milling and baking tests were made upon all the type mixtures shown in table 3 according to the methods described under "Procedure". Table 13 gives the grades, weight per bushel, protein of wheat and flour and ash of flour. Table 14 gives the baking results obtained in the three laboratories.

TABLE 13.—*Summarized results of milling data and chemical analyses at three laboratories.*

Sample No.	Grade and remarks	Weight per bus.		Protein in wheat 13.5% basis	Straight grade flour 13.5% basis	
		As recd.	13% B.		% Protein	% Ash
T 1	2° thin and shrunken	60.0	56.0	16.1	15.1	0.54
T 2	2°	60.0	56.0	16.3	15.6	0.49
T 3	2° thin and shrunken	59.0	55.5	16.5	15.6	0.49
T 4	2° thin, odd durum	59.0	56.0	16.4	15.6	0.52
T 5	2° thin, shrunken	59.0	56.0	16.6	15.8	0.48
T 6	3° 8% white spring	59.0	56.0	16.4	15.8	0.49
T 7	3° 16% white spring	60.0	56.0	16.6	15.9	0.48
T 8	Red and white spring	60.0	56.0	16.8	16.1	0.48
T 9	Red and white spring	60.0	56.0	17.1	16.6	0.49
T 10	2° thin	59.5	56.0	16.2	15.4	0.50
T 11	2° thin, soft variety	57.5	55.5	16.2	15.4	0.51
T 12	2° bleached	59.5	56.0	16.7	15.4	0.49
T 13	2° thin and bleached	60.0	56.0	16.9	15.8	0.50
T 14	3° thin and bleached	60.0	56.0	15.8	15.0	0.48
T 15	2° thin and bleached	60.0	56.0	16.0	15.3	0.51
T 16	2° thin and bleached	60.0	57.0	16.6	15.5	0.48
T 17	2° thin, shrunken 10% durum	60.0	56.0	16.7	15.7	0.48
T 18	2 Amber durum (17% A durum)	60.0	57.0	15.9	15.1	0.53
T 19	2 Amber durum (25% A durum)	60.5	57.0	16.0	15.3	0.54
T 20	2 Amber durum (36% A durum)	61.0	57.0	16.4	15.7	0.56
T 21	2 Amber durum	61.0	57.0	16.5	15.6	0.59
T 22	3° thin, shrunken	57.5	55.0	17.2	16.0	0.53
T 23	2 hard white spring	59.0	56.0	19.0	18.6	0.49
T 24		60.0	57.0	18.1	17.0	•
T 25	3° bleached	60.0	57.0	19.3	17.9	0.47
T 26	3 durum because red kernels	62.0	58.5	17.9	17.9	0.70

TABLE 14.—*Summarized results of baking tests made by the standard method at three laboratories*

Sample No.	Absorption	Gen. appearance		Crumb character		Loaf volume	Loaf volume as % standard	Baking score	Baking score as % standard
		Color	Form	Color	Texture				
T 1	62.7	4.2 P*	4.4 g	6.1 y	7.3 C	583	97	84	82
T 2	62.7	4.2 P	4.2 g	6.5 y	7.2 C	600	98	86	83
T 3	62.0	4.2 P	4.1 g	6.8 y	6.8 C	592	97	83	81
T 4	63.0	4.3 P	4.1 g	6.5 y	6.8 C	591	97	83	81
T 5	63.4	4.3 P	4.2 g	6.7 y	6.7 C	581	95	82	79
T 6	62.6	3.8 P	4.1 g	7.0 y	7.2 C	586	96	83	80
T 7	63.5	4.0 P	4.2 g	7.3 y	7.3 C	593	97	87	84
T 8	62.5	4.2 P	4.2 g	7.0 y	6.7 C	580	95	81	78
T 9	62.5	4.2 P	4.2 g	6.8 y	6.7 C	589	96	82	80
T 10	63.0	4.0 P	4.5 g	7.0 y	7.8 C	567	93	83	78
T 11	63.0	4.0 P	4.3 g	7.0 y	7.8 C	596	98	88	83
T 12	63.0	4.3 P	4.5 g	6.9 y	7.4 C	614	100	91	86
T 13	63.0	4.5 P	4.3 g	6.7 y	7.0 C	609	100	88	83
T 14	63.2	4.2 P	4.2 g	7.0 y	6.7 C	566	92	78	76
T 15	63.0	3.8 P	4.0 g	6.9 y	6.8 C	580	95	78	76
T 16	63.3	3.8 P	4.1 g	6.8 y	6.8 C	558	91	77	74
T 17	63.3	4.0 P	4.0 g	6.3 y	6.5 C	578	95	79	77
T 18	63.3	4.7 P	4.2 g	6.6 y	6.8 C	574	94	80	78
T 19	63.7	4.7 P	4.2 g	6.2 y	6.0 C&o	586	96	80	78
T 20	63.6	4.5 P	4.2 g	6.2 y	6.0 C&o	583	96	79	77
T 21	62.9	4.5 P	4.2 g	6.0 y	6.3	590	96	81	78
T 22	63.9	4.5 P	3.9 fg	5.7 y	5.0 C&o	587	96	76	74
T 23	63.2	4.5 P	3.9 fg	6.7 y	6.2 C&o	574	94	78	76
T 24	65.8	4.0 P	3.9 fg	5.5 y	3.0 C&o	642	105	81	83
T 25	62.3	3.3 P	3.3 fg	6.0 y	6.0 C	494	82	58	58
T 26	62.7	4.2 dull	2.7 fg	4.7 y	4.2 C&o	578	95	67	65

* P–pale; g–gray; y–yellow; C–coarse; o–open.

"It is evident from these data that for the season of 1929 admixtures of other wheat varieties with the Marquis produced very little if any effect and it is extremely doubtful that any of the differences noted can be considered significant. This may be attributed chiefly to the fact that all the wheat samples tested were very much above the average in strength. The Marquis, with 16.1% protein of wheat possessed sufficient strength to cover any inferiority of the other varieties in mixtures up to 40%, the maximum dilution made. The best test of relative quality of varieties is obtained with samples in which excess strength approaches the minimum. Slight differences then become quite apparent and it is possible to draw definite conclusions.

"Furthermore, with the samples under consideration, it should be noted that all the varieties being tested for inferiority were actually considerably higher in protein than the Marquis itself. As protein plays the most prominent role in determining strength, this fact alone would invalidate the test as it provides a variable over which no control was exercised.

"One may conclude that under the conditions of 1929 which favored the production of high protein wheat, the danger of lowering the quality of Marquis by mixing with other hard spring wheat varieties was very slight and even negligible. This, however, cannot be applied as a generalization for all seasons."[8]

[8]Statement by Dr. R. K. Larmour.

Conclusions

The study was commenced with the purpose of determining the extent of varietal mixing in Western Canadian wheat, the places where mixing occurs and the effect of such mixing upon milling, baking and blending qualities, for it is strictly upon a quality basis that Canadian wheat is grown for world trade. The investigation showed that the amount of detrimental varietal admixture in the seed of high quality varieties used by the farmers averaged 2.69% for Manitoba[9] and 1.78% for Saskatchewan[9]. It was further shown that this amount increased to 10.07% for Manitoba and 6.80% for Saskatchewan by the time the harvested grain reached the country elevator. The amount further increased to an average of 8.64% (of which only 0.34% was durum) in the ocean cargoes. Milling and baking testing laboratories have difficulty in determining the presence of as small a proportion of admixture as 10%. In the present investigation admixtures of 10% to 40% of inferior wheats with high quality wheat produced very little if any effect, on account of the fact that all varieties had high percentages of protein due to the seasonal conditions. Even in seasons when protein approaches a minimum, it is very doubtful if an admixture of 8.64% could be considered to have a decided bearing upon the quality of the crop. It may be concluded that the trouble with the quality of the Western Canadian wheat crops of 1927 and 1928 was *not* a matter of varietal impurity or deterioration. It may further be concluded that the wheat of Saskatchewan and Manitoba is *not* badly mixed but, on the contrary, is desirably pure in quality.

The place of mixing is shown by the summary of the purity of samples of Group I, the hard red spring wheats of high quality, as shown in table 9. The drop in purity subsequent to sowing was as follows:

	Saskatchewan	Manitoba	Average
Seed Drill to Country Elevator	5.02%	7.38%	6.20%
Country Elevator to Ocean Cargo	1.05%	0.64%	0.21%
Seed Drill to Ocean Cargo	6.07%	6.74%	6.41%

There was a large drop in purity between the grain in the seed drill and the grain delivered to country elevators, but practically no drop thereafter. The results show that mixtures occurring in the field and during threshing were more important than those occurring at all other places combined.

Summary

1. An investigation was made to determine: (1) the amount and kind of mixing of wheat varieties taking place at (a) the farm before sowing, (b) the farm after sowing, (c) country elevators, (d) terminal elevators and (e) transfer and ocean port elevators; (2) the milling and baking quality and the blending value of representative mixtures in comparison with pure Marquis. The study was conducted coöperatively

[9] In 1928 Saskatchewan produced 321,215,000 bushels of wheat from 13,790,854 acres and Manitoba produced 52,383,000 bushels from 2,660,125 acres. In 1929 the production was: Saskatchewan 160,565,000 bushels, Manitoba 28,565,000 bushels and the acreage: Saskatchewan 14,445,286 acres, Manitoba 2,300,615. Statistics from Canada Year Book, 1931, Dominion Bureau of Statistics, Ottawa.

by the cereal investigators of the Dominion Experimental Farms, the Universities and the Wheat Pools of Saskatchewan and Manitoba and a Manitoba official of the Dominion Seed Branch.

2. The investigation was commenced by a carefully planned collection of samples from seed drills (S.D.), country elevators (C.E.), inturns at terminals (T.I.), outturns at terminals (T.O.) and ocean cargoes (O.C.), and the distribution of the samples to the various experiment stations for growing and progeny identification.

3. For the analysis of the data the varieties were divided into six groups on the basis of market classes and quality for bread making as follows: (I) high quality hard red spring, (II) medium quality hard red spring, (III) white spring, (IV) hard red spring of odd quality, (V) red spring of poor quality, and (VI) durums.

4. The relative importance of the different varieties was determined by considering the samples of each class of origin as one large sample and by classifying the samples according to the variety predominating in each (tables 5 and 6). Marquis was the most prominent variety and constituted 720 of the 891 samples. No other variety was prominent in Saskatchewan, but Garnet and Red Fife appeared more frequently than the rest. In Manitoba Mindum (durum) was fairly prominent with 42 samples, and Garnet came next.

5. The importance of each variety group was ascertained (last line in table 5). Considering ocean cargoes, the class of grain most concerned with export trade, the amount of high quality varieties averaged 90%. The balance of 10% consisted almost entirely of medium, unusual and low quality red wheat, the amount of white wheat and durum averaging a third of one percent.

6. The basis of the distribution of samples was not the same in the two provinces (table 1), so a careful study was made of the results obtained by the three Manitoba stations on similar sets of samples (table 7). It was found that the results from different workers did not agree closely as to the proportions of the different varieties, but when the data were considered on a variety group (quality) basis the variations in the individual variety results proved to be relatively unimportant. It was concluded, therefore, that the data could be analysed as though the same method had been used in each province.

7. The placing of all of the high quality varieties in one group regardless of relative time of maturity, while theoretically open to criticism, did not obscure unfavorable mixtures within the group, since such mixtures were practically non-existent. (Table 8, particularly the Seed Drill section).

8. The analysis of the Group I samples (high quality wheats) showed the average group purity to be as follows: Seed Drill 97.77%, Country Elevator 91.67%, Terminal Inturn 92.90%, Terminal Outturn 91.25% and Ocean Cargo 91.36%. There was a drop in purity from the Seed Drill to the Country Elevator samples of 5.02% for Saskatchewan and 7.38% for Manitoba. The total further drop in purity was very small, the differ-

ence between the Country Elevator and the Ocean Cargo samples averaging 0.21% for the two provinces. *These results indicate that the critical place of mixing is in the field and during threshing. They also show that the group purity of the high quality wheats of Manitoba and Saskatchewan is above 90% at all stages from the time of sowing until the arrival of the ocean cargoes at their destinations.*

9. Wheats of Groups II, IV and V, considered collectively, showed a very high state of purity, the average being about 97%. Group III wheats averaged about 96% in purity with one exception. The durums (Gr. 6) also averaged above 90%.

10. The milling, baking and blending data showed that admixtures of varieties of Groups II, III, IV, V and VI with Marquis (representing Gr.I) produced very little if any effect. This may be attributed chiefly to the fact that all of the samples were high in protein.

11. The investigation as a whole demonstrated that the wheat of Saskatchewan and Manitoba, considered on a quality basis, is desirably high in purity at all stages, and that nearly all of the mixing that does occur takes place on the farm. The results indicate definitely that important difficulties with respect to the quality of Western Canadian wheat in any particular season may not logically be attributed to the effects of variety impurity or mixture.

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CURRENT PUBLICATIONS

36. Canadian Seed Growers' Association. Annual Report 1930-31. Published and distributed by the Canadian Seed Growers' Association, 336 Jackson Building, Ottawa.

This publication, in addition to the usual reports of officers, directors and committees, contains the proceedings of the Dominion Conference of Plant Breeders and five papers on seed production, which will be of interest to those who follow the work of the Association.

Dr. Kirk's paper on 'The Development and Registration of New Varieties of Forage Crops' is of a more general nature than the others and lays down principles which have been evolved after many years of experience in experimental plant breeding work and general seed distribution.

37. Co-operation in Marketing Dairy Products. R. W. Bartlett, Charles C. Thomas, Springfield, Ill. and Baltimore, Md. The author is a member of the staff of the Division of Agricultural Economics, University of Illinois.

This book brings together in convenient form the developments in co-operative marketing of dairy products in United States. "It is the aim of this book to present the essential facts of this development and the experiences of individuals and organizations engaged in the dairy industry, in order to provide a basis for an understanding of the major problems now confronting the marketing end of this industry." The book is divided into two sections—Part I, outlining the organization of agencies engaged in co-operative marketing of dairy products and Part II, dealing with price plans. The author distinguishes between co-operative marketing and co-operation in marketing. "Co-operative marketing as it is generally understood, is group action of farmers in the field of marketing to derive benefits not attainable by individual action. Co-operation in marketing is a far more comprehensive term and includes the co-operative activities of milk distributors and manufacturers, transportation agencies, consumer groups and trade associations as well as producer groups." J.C.

A METHOD OF ESTIMATING THE MEAN ANNUAL EGG WEIGHT.[1]

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One of the major problems on which the attention of poultrymen is focused at the present time is that of the weight of the eggs laid by the individual birds in a flock. The market value of an egg is determined by its interior quality and its size. Birds with very high production records may have produced eggs of a relatively low market value because of a high proportion of small eggs. Also, from a breeding standpoint large egg size is desirable since it is well established that large eggs produce large chicks. Consequently, the value of a hen should be judged not only by the number of eggs which she lays but also by the weight of her eggs. It is necessary, therefore, that the poultryman should have some knowledge of the weight of the eggs laid by the individual birds in his flock. Such information would permit the discarding of birds whose eggs will never reach standard weight (56.7 grams) before the end of their first laying year.

A knowledge of the type of egg which a bird lays can be obtained by weighing each individual egg, but it is obvious that this method involves too much labour. What is needed is first, a means of determining early in the pullet year those birds which will lay eggs of standard weight within a reasonable time, and second, to find a short period of time during which the weighing of a small sample of the eggs will furnish a reliable estimate of the mean annual egg weight.

The object of this paper is to present some information regarding these two points.

Variation in Egg Weight

From the studies which have been made on the weight of eggs, some facts concerning variation in egg weight and its causes have been well established. It has been shown that the eggs which are laid by a bird during her pullet laying year are fairly uniform in size and shape, Curtis (*4*), Hadley (*5*), Atwood (*2*). Studies by Benjamin (*3*), Hurst (*7*) and Hays (*6*), indicate that the type of egg laid by a bird is determined to some extent by factors which are inherited. However, the characteristic type of egg which a bird may lay is subject to considerable variation. Environmental factors such as food and housing conditions may influence egg weight, Atwood (*1*).

The first eggs which are laid by a pullet are smaller than those which follow. It has been shown that the earlier in life laying commences the smaller are the first eggs laid, Jull (*8*), Lippincott (*10*), Atwood (*1*). Hadley (*5*), observed that there was a tendency for hens possessing a higher mean egg weight to produce a first egg of greater value.

[1]Contribution from The Faculty of Agriculture of McGill University, Macdonald College, P.Q., Canada, Journal Series No. 10.
[2]Lecturer and Assistant Professor of Poultry Husbandry respectively.

There is a gradual increase in the weight of the eggs laid by a pullet until a maximum weight has been reached. Atwood (*1*) observed that the younger the pullets when beginning to lay, the greater was the percentage increase in the weight of the eggs and that the mean weight of the eggs increased concurrently with the increase in the weight of the birds. Jull (*8*) found a close relationship between the rate of increase in egg and body weights up to the time that maximum body wight is attained. The relation of the increase in egg weight to the time required to reach standard weight has been pointed out by Hays (*6*). Hays' data showed that birds must lay eggs which average 52 grams in November in order to lay standard eggs in March. Jull (*9*) found that in a group of 40 White Leghorns the eggs increased in weight throughout the first year; the data showed that the mean monthly egg weight for March closely approximates the mean annual egg weight. By taking a sample of the first ten eggs laid in March, Jull observed that while the average weight of the eggs in such samples served as a criterion of the mean annual egg weight of the group as a whole, it could not be used for individual birds. The weighing of the eggs one day a week gave a much closer approximation of the mean annual egg weight of an individual.

Source of the Data

The data given in the following tables were secured from the records of 74 Single Comb White Leghorn pullets. The birds were hatched during the months of March and April and the average age at which laying commenced was 180.2 days. Each bird included in this study laid some eggs in at least 12 months out of the 13 months which constituted the first laying year. The mean annual egg production was 211.3 eggs. The weight of all the eggs starting from the first egg until the end of the pullet year were recorded. The weighing of the eggs was done as soon as possible after laying. In order to eliminate seasonal effects in the study, the birds are arranged in accordance with the month when they began laying irrespective of the particular month which that happened to be. The mean egg weights and the probable errors were calculated by the usual formulae.

$$\left(\text{P.E.}_M = .6745\,\frac{\sigma}{\sqrt{n}}\right) \qquad \left(\text{P.E.}_{M_1 - M_2} = \sqrt{(\text{P.E.}_{M_1})^2 + (\text{P.E.}_{M_2})^2}\right)$$

Table 1.—*Mean Monthly Egg Weight.*

Month	No. of Birds	Egg Weight (Grams)
1	74	44.66
2	74	47.42
3	68	50.73
4	73	52.40
5	74	53.47
6	73	54.43
7	74	55.12
8	74	55.80
9	74	56.31
10	73	56.92
11	73	56.56
12	73	56.73
13	49	57.05
Annual		53.73

Table 1 shows the mean monthly egg weights for this group of birds. It can be seen that there is a gradual increase in the size of the eggs up to the tenth month, after which there is a slight drop followed by a small increase until the end of the year. As a group these birds laid small eggs. Standard weight (56.7 grams) was not reached until the tenth month. The mean annual egg weight was 53.73 grams. Weight of the eggs laid during the fourth, fifth and sixth months approximate the mean annual egg weight.

In reference to the number of days required to reach standard weight, as judged by the laying of five consecutive eggs over 56.7 grams each, the birds have been classified according to age in days laying, in table 2, and mean weight of first ten eggs laid, in table 3. Twenty-two birds failed to lay standard weight eggs during their pullet year. The data in table 2 indicate that in this group of birds the earlier in life that laying commences the longer the time required to reach standard weight. On the basis of mean weight of the first ten eggs laid it can be seen from table 3 that the smaller the first eggs laid the longer the time required to reach weight.

TABLE 2.—*Mean days required to reach standard weight.*

Age in Days Laying*	Number of Birds	Number of Birds Failing to reach Standard weight	Mean Days remaining Birds†
150 - 169	10	2	260.4
170 - 189	47	17	191.2
190 - 209	14	3	133.6
210 - 229	2	—	186.0
230 - 249	1	—	34.0
Total	74	22	186.5

* The term 'Age in Days Laying' means the number of days from the time the bird was hatched to the time of laying of the first egg.

† 'Mean Days Remaining Birds' represents the number of days from the date of the first egg to the time at which standard eggs were laid for those birds which laid standard weight eggs.

TABLE 3.—*Mean days required to reach standard weight.*

Mean weight of First 10 eggs	Number of Birds	Number of Birds Failing to Reach Standard Weight	Mean Days Remaining Birds
36.50 - 38.49	2	2	—
38.50 - 40.49	4	4	—
40.50 - 42.49	12	5	300.4
42.50 - 44.49	18	7	238.3
44.50 - 46.49	12	4	233.9
46.50 - 48.49	13	—	144.0
48.50 - 50.49	5	—	133.8
50.50 - 52.49	4	—	94.7
52.50 - 54.49	2	—	62.0
54.50 - 56.49	—	—	—
56.50 - 58.49	2	—	29.0
	74	22	186.5

TABLE 4.—*Mean Monthly Egg Weight.*

Age in Days Laying	150 - 169	170 - 189	190 - 209	210 - 229	230 - 249
No. of Birds	10	47	14	2	1
Months					
1	41.60	44.18	46.78	46.19	55.85
2	44.39	47.63	51.02	50.27	59.73
3	46.82	50.42	53.28	50.51	59.02
4	50.15	52.01	54.58	54.11	59.17
5	51.65	53.08	55.60	55.09	60.18
6	52.56	54.15	56.39	55.27	59.77
7	53.45	54.76	57.09	54.90	62.08
8	54.60	55.28	57.83	55.48	60.75
9	55.45	55.75	57.87	58.14	51.86
10	56.12	55.30	59.14	56.64	61.77
11	56.55	55.93	58.33	54.71	62.39
12	56.73	56.00	58.40	59.31	60.43
13	57.58	56.29	59.38	58.96	—
Mean Annual Egg Weight	52.13	53.17	55.72	54.57	60.26

TABLE 5.—*Mean Monthly Egg Weight.*

Mean Weight of First 10 Eggs	Number	Month						
		1	2	3	4	5	6	7
36.50 - 38.49	2	37.83	41.46	45.29	47.37	48.41	50.83	51.50
38.50 - 40.49	4	38.95	42.78	46.37	47.72	48.61	49.49	49.85
40.50 - 42.49	12	41.81	44.35	47.08	49.72	51.04	52.17	52.83
42.50 - 44.49	18	42.83	45.64	51.97	50.90	51.99	52.77	53.85
44.50 - 46.49	12	44.01	48.43	50.62	52.09	53.05	54.08	58.74
46.50 - 48.49	13	46.71	50.72	52.96	54.70	56.00	57.22	57.29
48.50 - 50.49	5	49.05	52.52	54.82	56.19	56.89	58.35	58.75
50.50 - 52.49	4	51.33	54.83	57.01	57.40	57.57	58.27	58.40
52.50 - 54.49	2	52.69	54.46	56.61	58.69	59.66	59.96	60.42
54.50 - 56.49	—	—	—	—	—	—	—	—
56.50 - 58.49	2	56.23	58.41	58.79	59.43	60.88	60.33	62.96
Total	74	44.66	47.42	50.73	52.40	53.47	54.43	55.12

Mean Weight of First 10 Eggs	Number Birds	Month						Mean Annual Egg Weight
		8	9	10	11	12	13	
36.50 - 38.49	2	52.52	52.85	53.94	54.18	54.19	55.06	49.47
38.50 - 40.49	4	50.94	51.93	52.07	51.33	50.34	51.37	48.68
40.50 - 42.49	12	53.47	53.35	55.04	54.09	54.54	55.32	51.15
42.50 - 44.49	18	54.41	55.42	55.96	55.97	55.46	56.29	52.28
44.50 - 46.49	12	55.60	55.24	55.81	55.05	56.66	58.73	53.32
46.50 - 48.49	13	58.01	58.88	50.11	58.86	59.52	59.71	56.39
48.50 - 50.49	5	59.37	59.11	59.76	59.44	59.81	58.93	57.14
50.50 - 52.49	4	58.18	59.98	59.52	60.36	60.16	60.60	58.47
52.50 - 54.49	2	61.13	60.73	60.59	61.67	58.10	—	58.72
54.50 - 56.49	—	—	—	—	—	—	—	—
56.50 - 58.49	2	61.37	63.19	63.75	64.03	62.98	—	61.03
		55.80	56.31	56.92	56.56	56.73	57.05	53.73

It is evident from table 3 that in order to lay standard weight eggs before the end of the pullet year, the birds in this flock must average 47.50 grams for the first ten eggs laid. Some of the birds with a lower mean weight of first ten eggs did reach standard weight, but not until they had been laying for well over six months. It would seem possible to eliminate those birds which will not lay eggs of standard weight during the first year of laying, by weighing the first ten eggs laid. While the rate of increase may vary with the strain of birds the use of such a method should enable a breeder to select out those birds laying very small eggs.

The monthly mean egg weight for the various classes according to the age in days at which laying commences is given in table 4. The rate of increase in egg weight for each group is gradual and continues until the end of the year. The earlier the birds commence laying the smaller are the first eggs laid. There is practically no difference in the amount of increase for the various classes.

Tables 4 and 5 show that the mean egg weights for the fifth and sixth months closely approximate the mean annual egg weight. In order to determine if a sample taken about this time would serve as an index of the mean annual egg weight the first ten eggs laid in the fifth month are chosen. Table 6 gives the differences between the mean weight of the first ten eggs laid in the fifth month and the mean annual egg weight for the different classes.

TABLE 6.—*Difference between mean annual egg weight and mean weight of first ten eggs laid in fifth month.*

(Arranged into classes according to the mean weight of the first ten eggs laid).

Class	Number of Birds	Mean Annual Egg Weight Grams	Mean Weight of 10 eggs (fifth month) Grams	Difference Grams
36.50 - 38.49	2	49.47 ± 0.012	47.66 ± 0.534	1.81 ± 0.534
38.50 - 40.49	4	48.66 ± 0.458	48.15 ± 0.602	.51 ± 0.756
40.50 - 42.49	12	51.15 ± 0.295	51.12 ± 0.429	.03 ± 0.520
42.50 - 44.49	18	52.28 ± 0.298	51.56 ± 0.364	.72 ± 0.470
44.50 - 46.49	12	52.32 ± 0.360	53.19 ± 0.369	.13 ± 0.515
46.50 - 48.49	13	56.39 ± 0.355	55.74 ± 0.418	.65 ± 0.548
48.50 - 50.49	5	57.14 ± 0.781	56.57 ± 0.789	.57 ± 1.110
50.50 - 52.49	4	58.47 ± 0.617	57.88 ± 0.648	.59 ± 0.894
52.50 - 54.49	2	58.72 ± 0.512	59.65 ± 0.013	.93 ± 0.512
54.50 - 56.49	0	—	—	—
56.50 - 58.49	2	61.03 ± 0.369	60.28 ± 0.471	.75 ± 0.598
Total	74	53.73 ± 0.266	53.33 ± 0.287	.40 ± 0.391

It can be seen that in each case the differences are small and not significant, the difference for the group being .40 ± .391. The records of the individual birds showed differences ranging from .04 grams to 2.87 grams. In two cases only were the differences found to be significant statistically. It would appear, therefore, that the weighing of the first ten eggs laid in the fifth month of laying gives a reliable estimate of the mean annual egg weight.

Conclusions

There is a gradual increase in the weight of the eggs laid by the pullets of this flock up to the end of the first year.

A considerable number of birds fail to lay eggs of standard weight (56.7 grams) during their first year. Birds whose first ten eggs average less than 47.50 grams are not likely to lay eggs of standard weight. The weighing of the first ten eggs laid in the fifth month gives a reliable estimate of the mean annual egg weight.

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THE RENAISSANCE OF RUSTIC ARTS[1]

GEORGES BOUCHARD, M.P.[2]
Agricultural School, Ste. Anne de la Pocatière, P.Q.

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Hearty congratulations are due to the New Brunswick Women's Institute on both the conception and the execution of their current convention and demonstration with a special view to the domestic arts. I can assure you it requires more than my ordinary courage, and even more than any customary disregard of formalities, to appear before so distinguished an audience and attempt to deal with a subject hard to reconcile with the so-called modern progress.

To many I may seem very old-fashioned, perhaps a ghost rising from the past or a man escaped from the last century, in introducing a topic of little practical value, something obsolete, worthy at the most to be relegated to the attics of the mind. It may be also that my natural inclination towards those traditional arts or my appreciation of the aesthetic side of life, coupled with my gratefulness towards my mother, who parted with many fine pieces of her own work, a sacrifice to my education, has if not misled, at least carried me too far. People with a mental structure entirely different from my own might question, if not my motives, at least the feasibility of the proposals. The decay of rustic art is to many superficial observers a normal and even a desirable thing, and their revival little more than an utopia—a silly dream.

I ask you and I ask the public in general if, in view of the widening breach that modern conditions have made between art and life, between the beautiful and the useful, one is not entitled to be art-minded up to a certain limit. I ask further, in view of the great social calamity—I refer to the desertion of rural life—if one is to be severely reprimanded for being rural minded to the extreme.

I am of the very firm opinion that it is of the utmost importance at the present time that we restore our national life to a sounder basis, not by recapturing the past for the sake of reinstating it integrally, but by returning to the fundamental principles from which we have departed too freely and too hastily. Our minds must be set on the future with a very clear vision of what took place in the past.

Allow me first to face the social aspect of handicraft work, second to point out the economic value of it, and third to offer a few suggestions for further action.

I.

Incredible as it may seem, the first question that comes to the mind or the lips of a simple-minded layman when one deals with rustic arts is: Does it pay?

1Lecture delivered before the Women's Institutes of New Brunswick, June 9, 1931.

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This is a very ingenuous and at the same time a very insidious question. The absence of any aesthetic sense or the habit of rating the labour hour with a pecuniary gain as the unique motive too often deters women from occupations apparently of little economic value but which are full of attraction and constitute a very important factor in our rural life.

The range of aspects is so great that very few, I am afraid, take the trouble of dealing with all of them.

If you consider craftsmanship as a part of our education and our enjoyment in life you might as well ask does it pay to learn music, does it pay to learn drawing and painting, does it pay to learn to dance, does it pay to say what I am saying, does it pay to listen? Who would venture to say that in our age of advanced education, more than one per cent of the people are deriving monetary advantages from their musical or artistic educational acquirements? Handicraft may not pay directly, but it pays in the long run because it gives satisfaction of an outstanding nature which money is powerless to produce. I am sure that handicraft benefits a larger proportion of its devotees than any of the above educational accomplishments.

Quality, durability and originality were the basic attributes of home-made work in the early days. Our grandmothers would never consent to part with a piece of work which did not, in the first place, satisfy themselves. As a matter of fact, in my own province, the districts where the rustic arts are most flourishing are those where there is the least tendency to market them. In more than one instance the easy marketing of handicraft work has incited a kind of undesirable speculation which resulted in the lowering of the quality and the trade as well. Who would expect an artist to make a painting with the money that he is to get for it as the only incentive. He paints to please himself, and later desire or necessity induces him to sell his work.

If you desire to perpetuate these handicrafts I cannot impress on you too strongly that you must foster the love of the work to a greater extent than the monetary value; for should the expected remuneration not materialize, there will be still the pleasure of creative accomplishment, the satisfaction of adorning homes, and perhaps more than anything else, the preservation of these relics for future generations. These sentiments prevailed in far less prosperous times if my recollections of boyhood are exact. Our grandmothers were above all concerned in producing something for the ornamentation of their home, or as an heirloom for the son and daughter. Economy and affection were the chief motives. A sale was made only as an over-supply, great need or other circumstances required.

Those of you who are more intimately acquainted with rural life realize to the full the attraction created by the family workshop. Visitors in a rural home, after being made acquainted with the last-born, are shown the hooked rugs, the embroideries, the home spuns, etc., their own created work in preference to the chesterfield, radio, or these modern things which anybody can buy with money. It shows the pride that they have in their work; their heart and soul are in it.

Will you follow me in imagination, or by recollection, into the home of a Quebec *habitant* during the winter season. Our sympathy for the jobless should not overshadow our admiration for the restless. Outdoors the snow whirls in the howling wind that shakes doors and shutters, the three-decker stove and the lamp create an atmosphere of warmth and light round them, pushing back to the far corners of the kitchen the cold and the shadows. Rhythmically the booming of the loom covers the purring of the spinning wheel and skein-holder, and following the baby's cry, the cradle rocks at intervals. The mother, with none of the harshness of a factory forewoman, carries on and supervises the work, singing with her children meanwhile snatches from an immense stock of Canadian songs. All are preparing the trousseaux which will be as enduring as the tenderness of their rustic hearts and the candour of their ingenuous souls.

These are still the domestic arts in their fullest development and they are still to be observed behind every second or third door. It is a scene of production, of gaiety, of song and of happiness. Seeming to dream in their old shell frames, the faces of their ancestors appear to lighten at the sight of those who continue their work. Who could seriously deny the social benefit of these winter works? Kept from the lure of idle dreams, the seduction of the catalogues and the attraction of big centres, imbued with an immense desire of accomplishing something useful, the young girls are preparing themselves to become the much needed real country wives, and later will achieve wide and well-deserved fame in the realm of home-making.

Would you blame me for speaking sentimentally of what is left of a glorious and peaceful past? If only for the sake of a real preparation for life, or for the sake of the aesthetic, should we not struggle to preserve this handwork? There is no greater source of beauty, of harmony, of pride, and no better protection against the gradual intrusion of banality into our rural homes. Is it not the natural instinct of the feminine mind to be individual in every form of adornment? For instance, who among you would like to have it said that you are wearing your neighbor's twin hat? To carry it farther, as far back in North Labrador as a dog's track could take him, my friend the artist Edwin Holgate has discovered among women this instinct to adorn themselves and their home and to put a personal touch into all their work.

I have noticed most particularly in the remote districts of Czecho-Slovakia, where mediaeval methods of production are still followed, the charm of a people untouched by what I dare call the vulgarity of progress. I have visited scores of homes in the mountains surrounding Trenchin and Bratislava and I was almost in ecstasy when confronted with the marvels accomplished by those women in the adornment of their home and their person. Never in my life was I so vividly impressed by the great contribution of rustic art to the enjoyment and contentment of people. There in each village the woman of most outstanding ability in these artistic works is appealed to when advice or criticism is desired, and annual competitions are held among the different villages to help maintain the highest standard possible. The

whole life of the people centres round these handicrafts and the result is great peace and contentment and happiness. Unfortunately there is elsewhere the proximity of big centres, which has been fatal to handicrafts. Rustic arts are very delicate flowers which the smoke of cities and railways destroy.

In summarizing this point which I have expounded perhaps too briefly let me state that domestic arts carry within themselves that which is paramount, transcending the force of money, and fostering education, aesthetics and home-life. This happens to be precisely one of those economic questions in which the human and moral factors count for much. Let me state further that when passing judgment on our time the future generation will be more impressed by our artistic development than by the blue books and the deposits in our banks.

In her report to the "Canadian Countryman" Nov. 8, 1930, following the Canadian Pacific Railway Festival in Quebec, Mrs. Mabel Crews Ringland depicted beautifully in these words a weaver from my own parish: "We were watching the deft fingers of a woman who sat at a loom skilfully directing its rhythmic movements and the clicking shuttle that slipped through the threads so smoothly. As she worked she sang softly a lilting "chanson" about the adventures of Marianne at the mill, and a look of utter contentment overspread her face."

Adverting to the assistance which I so gladly contributed as an interpreter, Mrs. Ringland says:

"Then he led us over to an interesting family group all clad in homespun, mother, father and two daughters from the Island nearby, whoses faces glowed with pride when we admired their work. Madame Plante was at the loom weaving the bright catalogne, the rag carpet with which the *habitants* cover their floors, while the others were busy knitting and helping in other ways. Seldom have I seen better team work or a happier family spirit. Besides the carpet Madame also makes homespun in many softly beautiful colors and designs, suitable for clothing, curtains, etc., as well as bedspreads, drapes and other articles of intricate pattern in both linen and wool. And best of all, her two girls are learning all her secrets of design and of dyes, her infinite accuracy and attention to detail, in short, all the technique of a good craftswoman and an artist. I mentioned this fact. 'It is always so', our guide explained. 'Our country mothers teach their daughters to be skilful in home crafts, and very early they learn how the work of their hands can brighten and beautify the home. When a suitor comes to call the young girl proudly shows him the work she has just completed by her own skill, and great importance is attached to it. You see even a mere man can tell by this what sort of wife she will make, for the work reflects the personality of the worker. She is encouraged to use her own ideas and express what is in her heart. So sometimes it is very beautiful'."

The rustic arts form one of the most interesting features of our country, and it is with this idea in mind, that our big transportation companies such as the Canadian Pacific Railway, the Canadian Steamship Company, etc., have found no better means of attracting tourists

than by displaying at festivals or exhibitions what has been accomplished in our modest rural homes. I can perhaps say with some assurance that no form of art has made a wider appeal all over the country.

II.

A plea for greater beauty in things of common use should not, I admit, be construed into a desire to "put back the hands of the clock" and return to mediaeval methods of production. I am not myself so fossilized in those ancient forms and means as to deserve the reproach of being opposed to any modern facilities or contrivances and of seeing an antagonism between both lines of action. On the contrary, modern machinery and up-to-date methods, instead of being regarded as foes to beauty, must now be considered as capable of being used for the multiplication of things that are both useful and beautiful. I am free to admit with Frank Rutter (Sunday Times, London, March 22) speaking about Swedish Industrial Art, "that the world is gradually learning that an article does not necessarily acquire artistic virtue simply because it is made by hand, but that even a machine-made article may have aesthetic qualities if it be soundly constructed and well designed to fit its purpose".

In the textiles most particularly ancient technique has been wedded to new art forms. These forms are not static. The renaissance of handicraft cannot be properly accomplished without the application of all modern discoveries and facilities. In the main what is most desirable is the individualistic finish associated, not with the factory, but with the artist's workshop.

What I consider a very essential factor in the fostering of handicraft is the invention and perfecting of modern machinery that will aid in the preparation of the materials in our rural communities. I admit with some reluctance that we have not gone very far in this regard. We have not yet emerged from the experimental stage, but fortunately there is a revival of activities along these lines because the Govrnment more and more is realizing the necessity of encouraging and assisting research work in this connection.

As an example of this, some five or six years ago a breaking and scutching machine was introduced at the Dominion Experimental Farm at Ste. Anne de la Pocatière. This has given such satisfactory results that now an average of 400 farmers in the surrounding districts are sending their products to be processed by this machine with which two men do as much work as twelve would do following the old methods. This has given a real impetus to the flax industry in my district. The other day at the Experimental Farm at Ottawa I saw in operation three breaking and scutching machines: one is similar to the one we have at Ste. Anne de la Pocatière; another was invented by Mr. George Knowles of the Fibre Division of the Experimental Farms System; and a third one, the Selvig Flax Fibre machine owned and operated by Dominion Fibres Limited, a Canadian company, is designed to handle ordinary field retted flax fibre straw and in one operation turn out long clean fibre suitable for the spinning

of thread to be turned into the highest quality of fabrics. The last two machines are designed to produce a continuous operation and can accomplish twenty to thirty times the amount of work performed by manual labour. These machines, which are still in the experimental stage, seem to prove satisfactory. The future will tell what additional improvements will be required in them.

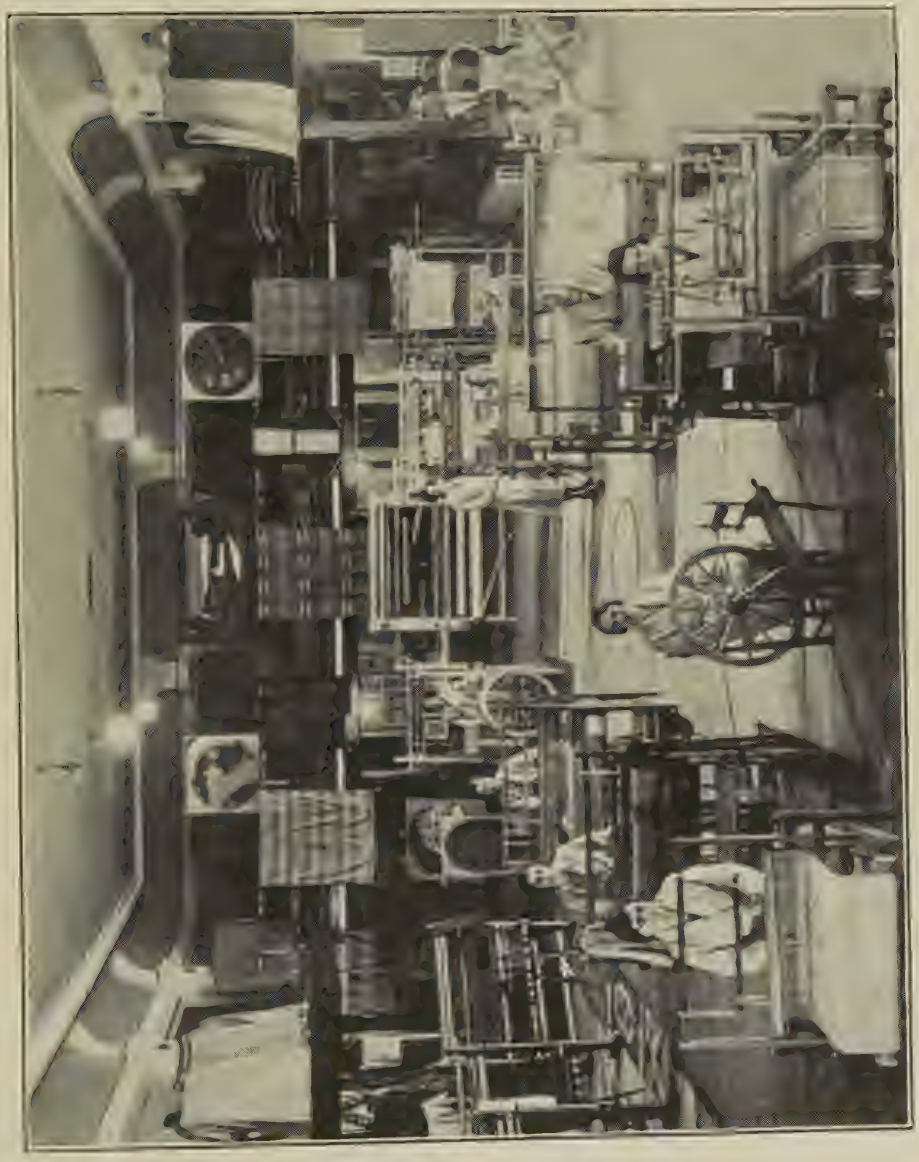
While admiring the gesture of the woman at the wheel, I would leave it to the poet to sing of its attractions, and would dream of some mechanical device to solve the problem of replacing this manual work. Pending the results of further investigation, it would be hazardous to assert something definite in this matter. Even in weaving, improvements are desired. It may be that the old-fashioned foot-loom could be very well improved or even replaced. This question is now the subject of very careful experiments at the School of Domestic Art in Quebec.

This School has also undertaken to throw a new light on many other matters. The question of vegetable dyes, so essential in this work, is being very carefully investigated for the benefit of the woman on the farm. I expect very much from this School, established a very few years ago under the supervision of the Minister of Agriculture for Quebec. It was founded to carry on experimental and demonstration work, and the Government experts and teachers of Home Economics in our schools will derive great benefit from this branch of the Agricultural Department.

To insure the full development of domestic art, we should keep in mind the two basic principles from which we have departed too often. First there must be some guidance. The women on the farm are expecting some leadership from the Government as, for example, in the use of dyes and in replacing old time methods of doing this work and in more adequate methods to effect saving in time and effort. A little assistance in this work encouraged by competition would do much to prevent the production of an inferior article which would not be a credit to its creator.

The other tendency, perhaps both more common and more dangerous, lies in the multiplying and copying of models even when of great reputed quality. We must not forget that objects very fine in themselves are depreciated by becoming too common. I do not hesitate to tell you that the standardization of models for rustic art is an element of death, although the standardization of methods could be accepted as a fruitful element. Further might I say with Rodin: "Art is the beauty of thoughts and feelings incorporated in everything man uses."

Another tendency against which we must guard ourselves in the development of rustic art is in keeping away from the imitation of exotic models. Whatever may be the artistic value of a foreign model, it does not carry any interest for the domestic buyer. Our art must remain basically Canadian and traditional. "It is natural", as Vincent Massey said before the Royal Society of Canada at last year's meeting, "in a country like ours, unique in the possession of a frontier with the provocation and allurement of unknown riches, that the minds of men should turn to a sphere of practical achievement with a great romance and glamour of its own."



The teaching staff at the Quebec Provincial School of Domestic Arts.

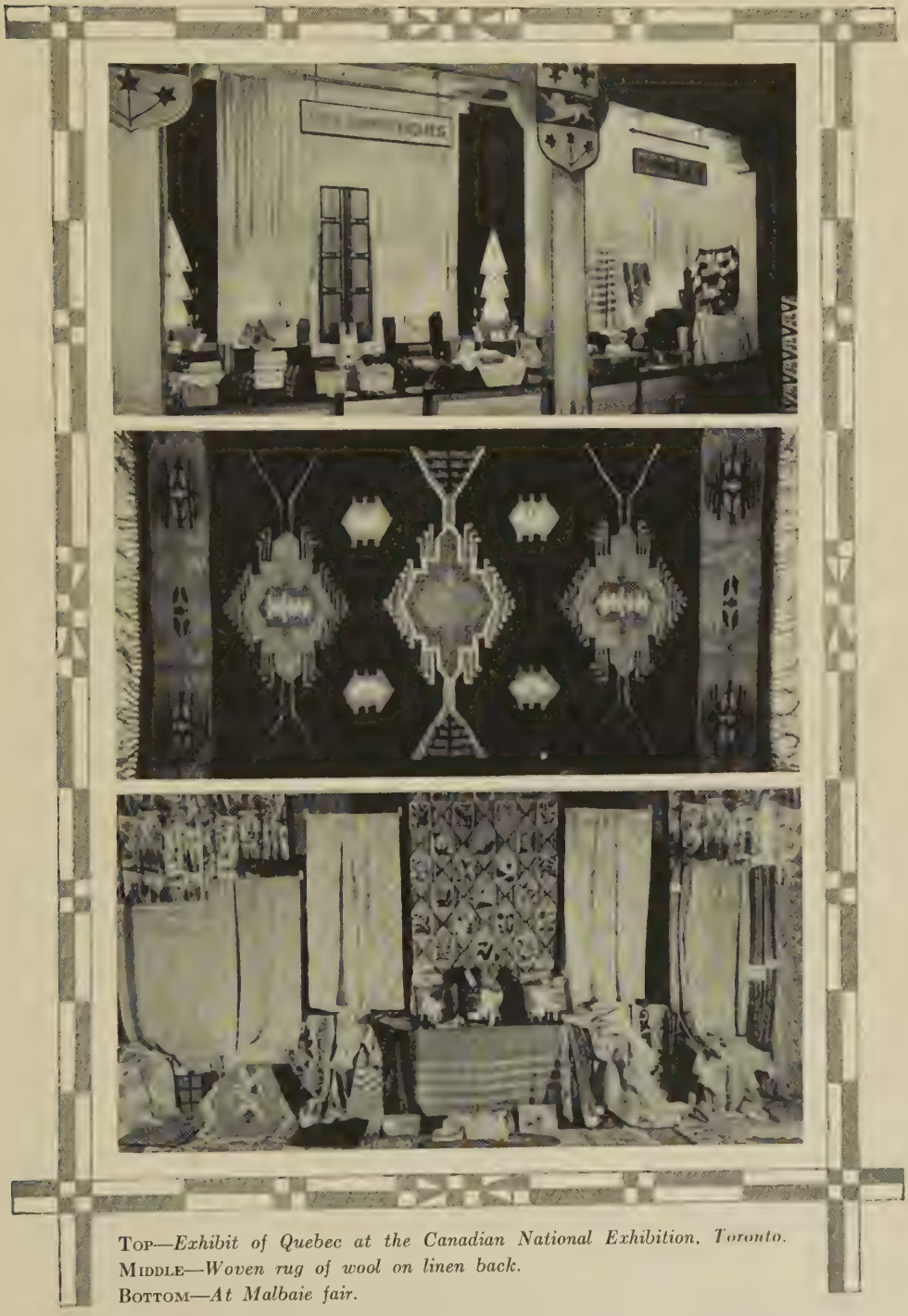
It is only when a people earnestly cultivates its feelings of veneration for its ancestors that it learns and appreciates to the full the secret of its own destiny. Tradition in its very nature does not mean stagnation. It does not mean to stunt development in these arts; on the contrary, it welcomes personal inspiration, it welcomes modern technique and anything that would tend to a fuller life and fruition to the people who embrace them. I wish that on the old but still living trunk of our traditional arts we could graft a branch of well-tested technique and modern inspiration that would bear fruit embodying characteristics both ancient and modern. In other words, should tradition and modern facilities be like a pair of wings, we should see the rustic arts take a new start and reach victoriously every corner of this country of ours.

In my opening remarks, when I attempted to show that pecuniary gain was not a proper standard for the appreciation of handicraft work, I had no intention whatever, believe me, of overlooking or disregarding the economic end of it. On the contrary, I am firmly of the opinion that this side of the question is not only very appropriate but very important. We must look at it with great care and find out the means of making handicraft a remunerative occupation. To keep body and soul together, in this crisis, we must not look only for spiritual food. Our distressful times are presenting a spectacle unprecedented in history: an excess of food and of general commodities and at the same time starvation and unemployment. Is it not a sign that we have departed too rapidly from a safer basis for our society?

Now I think, as I have always thought, that the only salvation for civilization is going back, not so much going back to former conditions as going back to *first principles*. Have we not parted too freely with the principles of a sound organization, with the principles of a real rural civilization distinct in many features from the urban civilization? Far from my mind is the idea of bringing into conflict these two civilizations: instead, we should have them complementary, we should have them prepared to cooperate still more intensely, but each should be kept distinct.

We ought to realize today that in an urban civilization, mass production has gradually discouraged local production. We have seen a quantitative or material civilization displacing a qualitative civilization; the useful has a tendency to replace the beautiful and the banal seems to have a very easy victory even to domination. Allured by the prosperity of big cities and by short hours of labour, our people have abandoned the farms with too little hesitation. Should we not pause for a while, and without attempting to apply the brakes on the wheel of progress, endeavour to restore our rural life on a sounder basis? Hard times are fertile in good thoughts and ingenuity. We are now at a turning-point. To my mind, our country-side, I repeat, should keep to itself its distinctive character. What advantage can one see in making country life entirely similar to city life?

New machinery and new methods of production are being developed at such a rate that there is no longer the same demand for manual work as there was a few years ago. This world is bound to turn to a shorter



TOP—*Exhibit of Quebec at the Canadian National Exhibition, Toronto.*
MIDDLE—*Woven rug of wool on linen back.*
BOTTOM—*At Malbaie fair.*

working day with more leisure left for home work and artistic expression. This world crisis if properly managed is just the dawn of a more prosperous and a more completely happy period. Hard manual labour will yield to more attractive, more artistic, more intellectual, and more technical work. Let us be ready for this change by fostering the home industrial arts as a source of enjoyment, as a means of cutting down expenses and as a source of revenue. Let us build up our handicrafts on a sound basis and they will not only survive, but they will help to bring back prosperity and contentment to the homes and to the country. After having given their unrestricted admiration to our material civilization and to the mass production of our industries, the people are beginning to realize the charm and the wearing qualities of hand made products with the mark of personality stamped upon them. More prosperous times will bring more facilities for the satisfaction of this natural instinct and desire. The pendulum which has swung too far to one side will no doubt swing back again and will finally take a normal position.

Now when I am asked if handicraft pays, I should like to make a few observations before giving an answer.

1. We do not expect out of it the high salaries which are paid in industrial centres. The salary after all is a very relative thing. I have no hesitation in saying that a yearly income of one or two hundred dollars earned in a rural home, while attending to some of the family duties, is worth, on the whole, a salary of one thousand or more a year, for office or shop work in a city. And besides what a difference in the preparation for real family life! If I remember well it is Saint-Simon who said "when you educate a man it is only an individual that you educate, but when you educate a girl you establish a school." There is no bigger asset to the rural community than a girl well prepared to establish a home, where not only rustic arts but all the sterling qualities which contribute to happiness and prosperity are flourishing.

2. If I am still asked if it pays I would point out further that as a matter of fact the financial success depends largely on the perfection of the work and the trade facilities. Tourists are certainly a great asset to our people, but there is no longer a demand for the cheap article. Buyers are all looking for something original and of a good quality. I may remark in passing that it pays to prepare ourselves to satisfy that natural instinct of our rural mothers to find a remunerative occupation for their daughters within their very homes.

I might, if time permitted, cite hundreds of cases where the handicrafts are a growing source of income. But I will content myself by illustrating that point with a very few instances. One case that I observed myself in Switzerland in 1928. Miss Edith Naegeli, a graduate from a school of arts, decided a few years ago to devote herself to weaving, and to that end she spent two years in Swedish peasant homes. She could find no finer school and no better workshops. Now she has a flourishing establishment with four foot power looms of the same type my mother used for over half a century. Her restless shuttles are furnishing the homes of the well-to-do people with home spun of remarkable originality and of good wearing qualities. Everything is done by special request to suit one specific

purpose in the furnishing of homes. She is an art scholar of considerable distinction.

Not very far from her in craft achievement is Madame Simon at Baie-St-Paul, Charlevoix County, in my native province. There you may visit a real workshop which is a great source of artistic production and of great revenue.

A few miles from this point up on the mountain at St-Urbain, Miss Irma Menard, a girl of eighteen, first trained by her mother and afterwards by herself, now sells by the dozen hooked rugs exquisitely delicate in line and colour, and surprisingly original. These rugs are sold at prices averaging $8.00 and more. A few choice exhibits are offered for sale in one of the biggest stores in Ottawa.[3]

I could point out to you many women in my constituency and elsewhere who are deriving benefits from their fascinating work. Those examples would be as illuminating as the ones just mentioned. A still greater demand for home spun has not yet been satisfied. In the closing days of the special session of September last I was wearing a home spun shirt and collar which attracted much attention.... and also many orders for the women on the farms to fill.

III.

Now summing up what I have said before, what has been stated in the past and my personal views on the matter, I venture to formulate a few suggestions.

1. While contrasting past with present and also with future we must have two things in mind:

(a) In the early days home industries were productive of articles of mere utility (i.e. linen for sacks, cheap home spun) as well as of articles of ornamentation. Today the attention must be confined mostly to the making of the fancy work. We are concerned at present with the beautiful rather than the useful only, because mass production has discouraged the producer of cheap articles.

(b) To survive, the handicrafts must get the benefit of modern technique, of mechanical devices, as well as of scientific research.

2. What is most needed today is a well equipped school of domestic arts in each province, if at all possible. I have held this in view for over eight years, and I am glad it has materialized. This school must take upon itself research work and demonstration as well. Problems of great multitude and magnitude have to be solved before we make much progress. Women on the farms crave greater information which very few, if any, are able to give. A school like this was inaugurated in Quebec two years ago as a branch of the Provincial Department of Agriculture. I am confident that under the supervision of our new Minister of Agriculture, the

[3]One of the finest of these was purchased by Mrs. W. D. Herridge, wife of the Canadian Minister Plenipotentiary to the United States, who wrote Dr. Bouchard as follows: "I was delighted to receive your letter telling me more of the history of the hooked rug which I value so highly. It is so very beautiful and has been so much admired by the many visitors who have come to our country home. Her (Miss Menard's) shading and colour as well as the placing and drawing of the design are so very fine and in no way does it reflect the amateur which you say she is."—(Editor).

Hon. Adelard Godbout, a real son of the soil, this institution will develop rapidly.

3. The Dominion Experimental Farms are expected to continue with their basic research work. They have done much in the past and they are expected to do still more in the future. The farmers are likely to learn from them how to produce flax and fleece best suited for home work. As stated previously, the Fibre Division of the Dominion Experimental Farms System has done much inventing and experimenting with breaking and scutching machines.

4. Cooperation which does not exclude fair competition is much needed. In my native province the home economics, the rural women's clubs (in the foundation of which I was associated fifteen years ago) and the women's institutes have done much in preserving and in giving a fresh stimulus to the handicrafts.

5. A proper grading of the handicraft article would prevent unfair competition, restore the confidence of the buying public and, at the same time, give more encouragement to the best producers.

6. The Department of Education could help in carrying on propaganda, by spreading the gospel of rustic beauty among the consumers as well as among the producers. Boys and girls at school might be taught accordingly. Appropriate songs evoking the noble gesture accomplished by the men and women on the farm would raise the prestige of these arts and prepare the rising generation to a truer appreciation of values.

7. Private concerns, transportation companies, stores, and hotel keepers might be called upon for a still further advertising campaign. Competition among rural hotel owners for the furnishing of real Canadian rooms with local colour has been already pointed out as a stimulating factor.

The Handicraft Guild in Montreal, under the guidance of a genial man of action, Colonel Bovey of McGill University, is carrying on a good campaign of advertisement and of sale.

To my mind the experts in the different phases of handicrafts should cooperate to produce in one volume a comprehensive survey of the entire subject in Canada. Hitherto there has been no attempt to treat the subject as a whole. A first-rate account of these matters would be most interesting and would reveal to the public treasures of an astonishing nature.

Then I appeal to you and I appeal to the public for a better understanding of the underlying principles on which handicrafts must be established.

I do not pride myself on having brought to you the final conclusions in this matter; I will be very satisfied in my most sincere desire to promote handicrafts if I have brought a little food for your thoughts and some material for further discussion.

Let us in the first instance pay a glowing tribute to the women of our generation who have maintained this beneficial tradition of home work. Let us try daringly to change the mental attitude of those vain, self-centred creatures disposed to measure up only in dollars and cents every sphere of activity. Let us put all our efforts together in an immense desire to study further our rural home requirements. Let us bend our energies towards the upbuilding of a resourceful rural life, and let us hope that, benefited by the rustic arts, the Canadian people will become more and more united and prosperous, and will grow greater and still greater among the nations of the world.

CURRENT PUBLICATIONS

38. The Agricultural Crisis. Volume 1. League of Nations Economic Committee, Geneva. June 15, 1931.

"Since 1927 the agricultural situation has grown more serious.

"The Economic Committee expressed its desire and its intention to hear periodically the views and the recommendations of agricultural experts ..... With the valuable assistance of the International Institute of Agriculture the Committee summoned a meeting in January 1930 of twenty and in January 1931 of twenty-four experts acquainted with the general problems of agricultural economy..... The consultation of the experts has enabled a distinction to be drawn between the characters and the causes of the crisis which for each country are national and characters and causes which are universal."

The report is intended to deal only "with facts which seem indispensable for defining the general aspect of the crisis". In the report there are five sections: Part I. General Characteristics of the Crisis; Part II. Causes of The Agricultural Crisis; Part III. Market Conditions; Part IV. International Factors of The Agricultural Crisis; Part V. Conclusions. A second division deals with the position of agriculture in various countries.

The findings of the Committee are summarized under seven headings. The more important of these, briefly, are:

1. The agricultural crisis is aggravated by the general disorganization which it has brought about. This is shown by increased customs regulations.

2. The position of the grain market is "fraught with danger. Negotiations are necessary for organizing the wheat trade. This organization should aim not only at improving home market conditions in each country, but also at promoting agreements with foreign countries." The difficulties in the way are admitted.

3. The Committee recommends the formation of groups of agricultural producers "numerous and disciplined enough to organize the sale of their crops."

4. The Committee believes custom duties on agricultural products "should be reduced as soon as an improvement in the world market takes place".

5. Internationally comparable data on prices paid to producers and by consumers should be obtained.

6. International credit would play an important part in the improvement of the conditions of agricultural production and trade and in the increase in markets.

The position of agriculture in various countries does not include Canada but a special report has been prepared by Dr. W. A. Riddell, Canadian Advisory Officer to the League. This will be available in a supplementary volume. J.C.

BUSINESS REVIVAL

J. E. Lattimer [1]
Macdonald College, P.Q.

[Received for publication October 20, 1931]

I.

One of the greatest obstacles to business revival is the arbitrary interference with the laws of economics and common sense. Proof of this contention is being continually provided as each proposed panacea finally fades, leaving a reaction that fosters the idea that there is faint hope of improved conditions. This arbitrary interference has been indulged in both by private industries and public bodies under the pressure of influential groups. As the depression became world wide so also has this interference become general, so that today no one country can claim to be free from this practice much less claim a monopoly of such interference. It is not contended that no public regulation is necessary but rather that these regulations, now as always, need to be examined with extreme care. So many cures for business depression are proposed and so few diagnoses of the disease available that the most important task would appear to be to enquire first how and why the present position has been reached. This requires at least a brief glance at past, but very interesting, history.

II.

The suspension of ordinary methods of doing business, the great expansion of some industries, the curtailment of other lines and the arbitrary interference with the currency during the world war may have been unavoidable. The continuance of this method of interference for almost two years after the war may have been open to some criticism. Be that as it may, the main point with reference to the present status of business is that this interference occurred with consequences which have an important bearing on present conditions.

Curtailment in some business activities such as building, furnishing and equipment, together with the expanded production of some raw materials left industry at the end of the war sadly unbalanced. The curtailment of business naturally occurred chiefly in those lines where demand could be deferred and thus accumulated. The gratification of this accumulated demand and the rebuilding of devastated areas, largely on borrowed funds, halted the post war deflation before it had proceeded far and made possible the industrial prosperity of the last seven years of the past decade.

The interference with the currency during the war and the post war period of inflation reduced the value of a dollar to about forty cents by June 1920. The deflation of 1920 and the following year, though bearing heavily on some industries, did not proceed far and a comparatively stable general price level was established with the dollar at about two thirds its former value. The general price level was considered sufficiently permanent to furnish a new base quite generally adopted in the year 1926. Many reasons may have combined to account for the incidence of the depression

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of 1921 to 1923 being greater on some industries than on others, but the major reason must be conceded to have been the stimulated expansion in some industries and the curtailment in others where demand could and did accumulate with later salutary effect.

The depression commencing at the end of the year 1929 and still prevailing is largely the deferred post-war deflation, deferred by almost a decade by the necessity of supplying the demand accumulated during the curtailment of the war period. The nature and exclusiveness of the period of prosperity from 1923 to 1930 makes this quite clear. Some industries had small share in this period of prosperity. Two industries termed "sick" during the period of prosperity were farming and coal-mining. These were two of the industries which had been stimulated in some sections by the war which interfered with production in other places. The industries enjoying prosperity during the last decade included the building trades where destruction had been enormous in some sections and curtailment important in others.

The post-war period of prosperity was made possible by an enormous expansion of international credit. This development was by no means confined to war devastated areas. We recollect a comparatively recent loan of eighty-five million dollars to Brazil, a country which probably in pre-war days, or today for that matter, would have difficulty in floating a loan for as many cents. What were these international credits used for? In some cases loans made possible payments of interest on previous borrowings. Necessary as this may sometimes be, it is not the surest way of averting a crash but may sometimes result only in deferring it. Some loans were used for expansion of plant which eventually increased the capacity for production, and some loans were made to "stabilize" prices, of which more anon.

Increased capacity for production stimulated a struggle for markets. The struggle for markets led to trade restrictions which eventually hampered business. While international credit freely flowed the purchasing power of the world increased. The period of prosperity was extended somewhat by the more general practice of instalment buying than had previously prevailed. The major prop furnishing the foundation of the recent prosperous period was clearly the free flow of international credit.

The free flow of international credit was finally interfered with. Time for repayment found productive capacity increased, the struggle for markets keen and trade barriers difficult to surmount. International credit must be founded upon greater freedom of exchange of goods than recently in evidence. Otherwise a concentration of currency may occur. If the currency be gold a maldistribution of gold may develop.

The contention that the distribution of gold will automatically adjust itself between nations presupposes a freedom of trade not now prevailing. It also presupposes some unanimity of policy in different countries as to the proportion of currency supported by gold. Under such conditions the inability to pay international accounts with goods on account of tariff barriers necessitates payment in gold. As the quantity of gold increases in one country the supposition is that prices in that country will rise and

automatically gold will be redistributed. Under such conditions it has been claimed that the distribution of gold between countries was almost as simple as water seeking its own level. Granted, if there were no impediments. It is not difficult to make water flow only in one direction. All that is necessary is a check valve on the outflow. On account of trade restrictions considerable gold has been of necessity used to settle international balances. Gold has been flowing in one direction. The check valve has been the monetary policy of gold importing nations preventing the increased amount of gold inflating prices and redistributing the gold automatically. Such conditions must draw gold into the coffers of those countries able to maintain a favourable trade balance including in this balance "invisible" items as well as commodities. This is almost as simple as filling a reservoir with water. All that is essential is a check valve allowing the flow to proceed in one direction only and a reservoir with sufficient capacity to avoid overflow. The unequal distribution of gold is not the *cause* but the *result* of the unequal trade and productivity of nations. Creditor nations must eventually—perhaps after they have acquired the major portion of the gold—accept goods or defer collections. This is fundamental. It was apparent years ago. Conditions have not changed recently in this particular. Nor will they change, be the world currency gold, silver, or simply I.O.U.'s. Only brief discussion of the causes of the depression is here presented in order to allow more detailed treatment of some of the proposed panaceas recommended for overcoming the difficulty.

III.

The prolonged period of recent prosperity puzzled many who sought to explain it. There were not wanting those who proclaimed a new economic era had arrived in which business cycles could be completely ironed out. The fairly well established fact that booms contain the germ of their own undoing and the corollary that depressions also will cure themselves—if natural correctives are allowed to act—was forgotten, as also was the logical conclusion that the longer the boom period and the higher the peak attained the more drastic and prolonged the depression necessary as a corrective. Such ideas received short shrift. More general was the feeling that the depression was unnecessary and must be overcome by some positive programme.

In this endeavor to overcome the depression the idea of stabilization was prominent. Now, stabilization may be applied in two ways, either to industries or to prices. Perhaps in some cases this may amount to the same thing. In some cases, moreover, we are now certain that one method eventually to bring chaos to an industry is unwise endeavor to stabilize price. In the early part of the depression endeavor to stabilize price appears to have been the most popular meaning attached to the term. Hence some very brilliant rear guard actions have been witnessed in the general campaign against falling prices. The endeavor to stabilize prices was well under way during the latter months of the boom period but was just getting into its stride when the depression started and may be studied in all its glory in 1930. First resorted to in order to combat the drastic decline in prices of some raw materials the application spread and still

prevails though some signs are discernible that the policy is now losing some of its popularity.

Price declines were attributed to overproduction of some lines of goods. To remedy this situation attempts were made to stabilize prices. The consequence not difficult to foresee was an increase in the surplus. The general adoption of stabilizing price plans though they may have made the decline less steep certainly prolonged it. A price which provokes a surplus is an unnecessarily high price. Had low prices—the automatic governor of quantity produced—been allowed free play surplusses of some products would not have been so burdensome as they are today. Here again the withdrawal of stabilization programmes in some instances already heralds improved conditions.

With regard to farm products much time was lost in debating the question of whether or not a surplus existed. It is quite understandable that a world in which the battle had always been to secure plenty should hesitate to admit the presence of a surplus of food products. But, when two years' coffee was available, one year's sugar on hand and almost sufficient wheat carried over to satisfy international trade for a year, then, it was generally conceded that effort should not be expanded but should be contracted in the production of these goods. Not only that, but storage became a problem and the providing of credit to carry these goods. This surplus accumulated before the depression set in, the carrying of these goods was one factor in bringing it on, and yet, confronted with this condition, some writers maintained that the depression could not continue long as inventories were light.

The effort to stabilize price though calamitous when applied to raw materials was applied elsewhere. A well known plan to overcome the depression was the conference of business men and labor leaders who agreed to maintain wages. One member of this party agreed to go one better than that by raising wages and at the same time lowering prices. This was done. But there was one rather important point overlooked in this promise of raising wages, and that was that the regularity of employment was not mentioned. Wage *rates* have been fairly well maintained, so far, but *pay rolls* have been reduced considerably through unemployment.

IV.

The decline in prices of raw materials generally, and farm products in particular, was so extreme that production was admittedly carried on in some sections and by some individuals at a loss. The attempt to stabilize prices having been unsuccessful the next step was to bonus production. This again is nothing new. But similar to the endeavor to stabilize price the result to be expected is simply deferring difficulty. The price is low because a surplus is available. The remedy required is to produce less. This will result in time, if prices are not interfered with. It is admitted that this natural corrective operates slowly even when allowed free play. Yet this process is made more tardy by the tendency evidenced in many sections of the world to bonus the production of goods now sold below cost of production on account of the surplus available. If it were desirable to

make the depression permanent this would appear to be the most logical way to set about it.

The alternative to bonusing unprofitable business must of necessity be the elimination of the marginal or high cost producer and eventually the smaller supply of goods an excess of which has brought about the low price and the pretext for granting the bonus. Elimination of the sub-marginal producers is not only the best thing for the industry but also for those eliminated. Those crowded out may and must seek other and more profitable lines of effort. The immobility of labour and capital has always been given as one reason for inequality in reward of effort in different industries. This immobility will be increased by the bonusing of the production of goods now over-abundant.

V.

Another widely heralded remedy for the depression was increased expenditure on public works. This procedure has been recommended for years and in this particular instance was quite generally adopted, while revenues were redundant. Increased expenditure on public works during the early months of the depression is being followed later by curtailment made compulsory in many places through lack of public funds. To make this programme effective in ironing out the business cycle necessitates saving *by the public* during prosperous periods for times when revenues are reduced. This is hard to accomplish, possibly more difficult even than similar saving individually which indeed, if carried out, would eliminate business cycles altogether.

The greatest difficulty of this treatment of the depression is the lack of funds. The ultimate success of this method depends upon how necessary, profitable or valuable the undertakings prove to be. One point is apparent and that is that there seems to be no lack of jobs which need doing. This is a direct refutation of the claim frequently encountered that there is general overproduction.

VI.

During the past two years the proclaiming of some solution of the problem of business depression has been fairly frequent. The passing of these remedies has been just as regular though less ostentatious. It was proclaimed by many that the depression could not last long as inventories were small even while surplusses of raw products were of such proportion that prices were on the toboggan. The era of stabilizing price occupied the stage for a considerable time but this eventually declined in importance. Similarly the necessity of retaining the wage scale was and is tenaciously adhered to in many quarters. Few disagree with the desirability of high wages provided that these high wages are inclusive. The inequality of wage rates as we shall later see is one of the major factors in preventing business from expanding. As one by one these panaceas have faded another one appears. The last, and judged by the amount of publicity received by no means the least, is the demand for a new currency. There is one factor, however, which so far as we are aware has not yet received much consideration. This is the inequality of the reward of effort in

different industries as reflected in the wide disparity of prices. This largely neglected factor is, in our estimation, one of the chief obstacles to business revival. Further, this point will remain to be struggled with no matter what currency eventually may become popular.

VII.

Price declines are never uniform. Eventually, if not interfered with, the "lag" disappears and some degree of uniformity on a new basis evolves. This allows business to become active again. The present inactivity in business is largely accounted for by the fact that the purveyors of raw materials, the prices of which have fallen drastically, are unable to do much business with the purveyors of other goods and services the prices of which have not fallen in proportion. Further, if some of these are able they are unwilling for the same reason. This prevents business from being brisk and leaves many who have not as yet agreed to reduce the cost of their goods or services suffering from unemployment.

Obviously the saving that is made on the purchase of those materials available at a low price leaves a wider margin to spend on some other goods. Yet this is not the only or even the chief consideration. The purveyors of raw materials, in some countries particularly, are the important exchangers of products which furnish the bulk of goods to be transported. Some of these goods are now and have been for the past year at such a low price that they cannot be moved. Again, the purveyors of raw products are the purchasers of machinery and equipment for expansion—when the products which they have to exchange command sufficient price to warrant such purchases—which is not now. Hence the stagnation in these particular lines of business dependent upon the purchasing power of the producers of some raw products. Apparently the choice is still open to some industries to reduce prices or take their punishment in unemployment. This question will remain to be met no matter what form of medium of exchange may be in use.

The present disparity in prices is generally conceded. Specific differences vary according to the section and the commodities referred to. Definite differences in Canada are available from figures supplied by the Dominion Bureau of Statistics. By comparing the cost of items in the family budget for the month of July 1914—the last prewar month—with the same month in 1931 we find the following result:

	Food	Rent	Fuel & Light
July, 1914	$7.42	$4.83	$1.89
July, 1931	8.11	6.95	3.18
Percent increase	9.3	43.9	68.3

These figures refer to retail prices and indicate that even as reflected in retail prices some classes of industries secure a comparatively lower return than do others at the present time, even after two years of depression. Reference to wholesale prices reveals even greater discrepancy as the following figures from the same source make clear.

Index Numbers July 1931
1926—100

Wholesale prices	71.7
Canadian Farm Products	55.4
Raw and Partly Manufactured Goods	60.8
Producers Goods	67.4
Fully and Chiefly Manufactured Goods	74.3
Consumers Goods	76.0

These figures are self-explanatory. Even after making generous allowance for flexibility in the matter of price trends, they would appear to warrant the following conclusion — *the present lack of uniformity in prices is a major cause of retarding business.*

Prices out of line with one another block business internationally. Nations specialize in the production of goods which will utilize to the greatest advantage their natural resources of men and material. These goods must be exchanged internationally. When prices are too far out of line with one another international trade suffers, car loadings decrease and ships are laid up. Australia appears to have been affected adversely in the early stages of the present depression by the comparatively low exchange value of its raw materials. Trouble ensued. Eventually not being able to sell to advantage or borrow at favourable terms, imports were reduced and during the last few months a favourable balance in goods has been achieved. In the meantime some nations specializing in the production of goods the prices of which have not declined proportionally are not thriving on account of markets failing. Apparently financial punishment is not limited only to the difficulty of prices too low comparatively; another way in which it may be met with is lack of volume of business.

Restrictions on international trade have reached such proportions that the trend at present appears to be largely toward self-sufficiency and independence. Internal trade suffers in precisely the same way. Business is brisk when every purchaser considers that he is securing value for his money. It is likely to be less brisk when prices are as far out of line with one another as they are at present.

Greater uniformity in prices would not only allow the producers of raw materials generally a greater purchasing power to buy manufactured products, but further it would also go a great way toward persuading those who are able to buy to be willing to buy, thus restoring confidence in business not too evident at the present time.

The required readjustment of prices will come eventually provided such adjustment is allowed to take place. Prognostication has no particular place in this discussion yet we venture to suggest that directly or indirectly, and more probably the latter, the natural correctives necessary in order to make business more brisk will get in their work when many of the panaceas presently popular have proved not only powerless as a stimulant but definitely harmful, as their greatest influence is in deferring business revival.

PARASITES OF WILD BIRDS IN QUEBEC[1]

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Introduction

The number and variety of wild birds observed in the vicinity of the college poultry plant, during the course of investigations being carried on with the parasites of poultry, suggested the inclusion of some studies of the wild bird parasites to see if the latter hosts might be in any way responsible for the transmission of poultry troubles. During the summer of 1930 this work was included in the programme of poultry parasite studies and examinations of certain of the commoner species of wild birds made for parasites. All parasites noted herein were collected during June, July, and August of 1930.

External Parasites

In securing this material the freshly killed birds were placed on clean white paper and then transferred to an ether chamber. After about half an hour the birds were thoroughly brushed and shaken over the paper. The parasites were then collected from the white paper and mounted in the usual manner. This method of securing material was found to be very satisfactory. The lice were identified by Professor A. W. Baker, of Guelph, Ont., and the mites by Dr. H. E. Ewing, of Washington, D.C. The parasites collected and determined are the following:—

Host	Parasite
Corvus americanus Audubon (Crow).	1. *Myrsidea* sp. 2. *Philopterus corni* L. 3. *Degeeriella rotundota* Osh.
Scolecophagus carolinus. (Muller.) (Rusty Grackle).	1. *Liponyssus sylviarum* Can. & Fanz. 2. *Degeeriella illustria* K.
Planesticus migratorius. (Robin).	1. *Liponyssus sylviarum* Can. & Fanz.
Passer domesticus (L.) (European sparrow).	1. *Liponyssus sylviarum* Can. & Fanz.
Sturnus vulgaris (L). (Starling).	1. *Liponyssus sylviarum* Can. & Fanz.
Galeoscoptes carolinesis (L). (Catbird).	1. *Liponyssus sylviarum* Can. & Fanz.
Dryobates villosus (L). (Hairy Woodpecker).	1. *Liponyssus sylviarum* Can. & Fanz.
Tyrannus tyrannus (L.) (King bird).	1. *Liponyssus sylviarum* Can. & Fanz.

1. Part of poultry parasite investigation, receiving financial assistance from the National Research Council of Canada.

2. Deceased. This paper was written by Mr. Alex. D. Baker, Macdonald College, with whom Mr. Rayner was associated in this work.

Progne subis. (L). (Purple martin).	1. *Myrsidea dissimilia.* Kellogg. 2. *Philopterus domesticus.* Kellogg. 3. *Liponyssus sylviarum* Can. & Fanz. 4. *Ceratophyllus riparius.* Jord. & Rothe.
Colaptes auratus luteus (L.) (Flicker).	1. *Degeeriella straminea* Denny (*Nitmus candidus* N.)
Columbia livia. (Pigeon).	1. *Esthiopterum columbae* L. (*E. baculus*). 2. *Goniocotes bidentatus.* (*G. compar N.*)

The outstanding feature of the above is the very widespread occurrence of the Northern Fowl Mite, *Liponyssus sylviarum,* among these species of birds. This mite had been found previously on poultry in this vicinity (Maw 1931). Its sudden appearance at different times at more or less isolated sections has been somewhat puzzling. The role which wild birds may be playing in the spread of this mite appears to be rather clearly indicated.

Internal Parasites

While it is not possible to present fuller details of the results of work carried on under this heading at this time, a preliminary report can be made. Indentifications of parasites are by Dr. Eloise B. Cram, Dr. E. W. Price, and Miss Myra F. Jones, all of the Zoological Division, Bureau of Animal Industry, Washington, D.C.

Host	Parasite
Planesticus migratorius. (Robin).	1. *Southwellia* sp. 2. *Hymenolepis* sp. 3. *Porrocaecum* (*P. ensicaudatum*?) 4. *Capillaria exile.* 5. sp. of Dicrocoelidae.
Passer domesticus (L.) (European sparrow).	1. *Anochotaenia globata* 2. *Monopylidium* or *Choanotaenia*?
Colaptes auratus luteus (L.) (Flicker).	1. *Liga brasiliensis* 2. *Raillietina comitata*
Corvus americanus Audubon. (Crow).	1. *Porrocaecum* sp. (Probably *P. ensicaudatum*).
Sturnus vulgaris (L.) (Starling).	1. *Monopylidium* sp.
Scolecophagus carolinus (Muller). (Rusty Grackle).	1. *Eurytrema* sp.?
Progne subis (L.) (Purple martin).	1. *Plagiorchis* sp. 2. *Platynosoma* sp.
Tyrannus tyrannus (L.) (King bird).	1. *Lyperosomum* sp. 2. *Plagiorchis* sp.
Columba livia. (Pigeon).	1. *Ascaridia columbae.* 2. *Capillaria columbae.*

From the above there appears to be no definite indication, as yet, that any of the internal parasites of the domestic fowl are being harbored by the above species of birds. Of the hosts indicated the robin, *Planesticus migratorius,* was noted as being frequently heavily parasitized. From our knowledge of the food habits of this bird it would appear to be partially explainable through its considerable consumption of invertebrates.

REFERENCES

MAW, W. A. The Northern Fowl Mite, *Liponyssus sylviarum,* in Quebec. Scientific Agriculture, *11*: 710. 1931.

CURRENT PUBLICATIONS

39. PROCEEDINGS, VOL. 69, NATIONAL EDUCATION ASSOCIATION OF THE UNITED STATES. 1201 Sixteenth Street N. W., Washington, D.C.

This volume contains the proceedings and addresses of the sixty-ninth annual meeting of the Association held at Los Angeles, California, June 27—July 3, 1931. Of particular interest to agriculturists is the report of the First National Conference on Rural Education. This section of the volume contains sixteen papers on rural school problems. In addition to this the regular department of the Association on rural education presents twenty-seven papers with special emphasis on the training of teachers. Scattered throughout other sections of the Proceedings will be found papers with a rural bearing and also a few which apply to college education. This volume and preceding ones may be secured on loan from the Department of Agriculture Library, Ottawa.

40. MARKETING OF FARM PRODUCTS. L. J. Norton and L. L. Scranton. Published by the authors. Available from the Department of Agriculture Library, Ottawa.

The authors state that this book is an experiment. It is an attempt to present the subject in suitable form for use with vocational classes, either when marketing is taught as a separate subject or when it is included as part of a commodity study. The book is written with the farmer's viewpoint in mind and includes considerable material on marketing processes. Each chapter contains a discussion of the underlying theory or a description of the facts involved in the subject under discussion, followed by a set of problems for class use.

As this material is all prepared for the use of students in the United States the book loses much of its value in Canada. It presents, however, a teaching principle of great value which could and should be adapted to Canadian conditions.

SOME OBSERVATIONS ON COST OF WHEAT PRODUCTION DATA FOR SASKATCHEWAN

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There are two general methods recognized by research workers in Farm Management for arriving at cost of production figures, namely, detailed cost accounts, and the farm business survey. The greatest disadvantages associated with cost accounts are in their almost prohibitive cost and difficulties associated with time and selectivity. On the other hand the relative cheapness of obtaining costs by the survey method enables a larger number of cases to be studied. However, the necessity of estimating, inherent in the survey method, will at times detract from the accuracy of the final figures. In common with the cost account investigator the survey student will find that one of his problems is the adequacy of his sample. Is the sample truly representative? Is there any element of bias present? Are the final figures calculated from the sample fairly close to the most probable true figures for the universe, of which his material is merely a sample? This article is an attempt to answer the last question with reference to data on cost of wheat production for Saskatchewan.

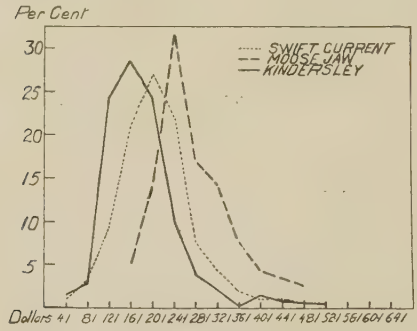

Figure 1.

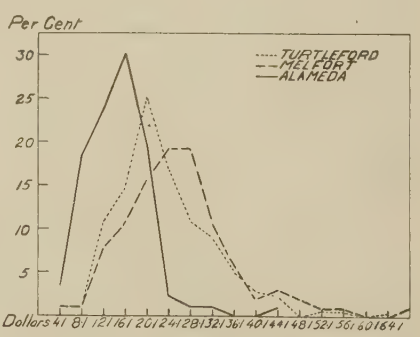

Figure 2.

Figure 1. Percentage distribution of farms in Saskatchewan according to Cost of Production Per Acre of Wheat. 1927, Swift Current 95 farms; 1925, Moose Jaw 118 Farms; 1929, Kindersley 215 farms.

Areas surveyed that have a comparatively high percentage of total cash receipts from wheat have a low coefficient of variability of costs per acre and a comparatively low relative probable error.

Figure 2. Percentage distribution of farms in Saskatchewan according to Cost of Production Per Acre of Wheat. 1929, Turtleford 176 farms; 1925, Melfort 104 farms; 1926, Alameda 93 farms.

Areas surveyed in the Park Belt in Saskatchewan show relatively more diversification than areas in the south or central part of the province. Park Belt districts have a higher coefficient of variability of costs per acre and a greater relative probable error than farms in the more concentrated wheat area.

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The two best methods adapted to the survey system of obtaining costs are the "Input" and the "Major enterprise" approaches. As wheat production is distinctly the major enterprise on the majority of Saskatchewan farms, this method of obtaining costs has been employed by the Farm Management Department of the University of Saskatchewan in arriving at cost of wheat production. Briefly this method may be described as follows:—From the total farm expenses, which include all cash expenses, unpaid wages of the operator and his family, interest at 6 per cent on the average inventory, and depreciation on all equipment and buildings, are subtracted all the non-wheat receipts of the farm, both cash and non-cash. The resulting balance of expenses is divided by the number of acres of wheat and the number of bushels of wheat sold to obtain the costs of production per acre and per bushel.

The assumption behind this method is that the items forming the non-wheat receipts on the average, are sold for the cost of production. Thus by subtracting the total non-wheat receipts from the total farm expenses we are eliminating the expenses due to the non-wheat receipts. The balance of the total farm expense is due entirely to wheat. Some people might argue that this is not a fair way to estimate costs because the non-wheat receipts might be produced at a profit over and above cost of production, and by the above methods of calculation, the cost of wheat production would consequently be lowered, to the extent of the profit on the non-wheat receipts. The reverse would be true if the non-wheat receipts proved to be produced at a loss. However the assumption is as stated formerly, that on the average the non-wheat receipts are sold for the cost of production. This probably holds true in most years. Even if it were not exactly true the error in the total wheat expense would be relatively small where wheat sales are decidedly the predominating revenue. Also, since wheat production on the farms is the most important enterprise, one is justified in believing that any small profit or loss on a minor enterprise does actually lower or raise the cost of production of wheat.

Starting in 1926 Dr. Wm. Allen of the Department of Farm Management of the University of Saskatchewan has conducted a series of Farm Management surveys in various parts of the province which are fairly typical of larger districts surrounding the particular areas studied. In 1926 two areas were studied, Moose Jaw in the south, typical of the heavy clay land of the great plains area, and Melfort in the north eastern section of the Park Belt, typical of the best part of the northern Park Belt.

In 1927, the Alameda district was studied; this area is representative of the south eastern portion of the Park Belt. In 1928, the Swift Current area was visited. This is fairly typical of the medium soil types of the south west but primarily a wheat producing area. In 1930, in co-operation with the Canadian Pioneer Problems Committee, two areas were studied, Turtleford in the north western Park Belt, typical of the north western Park Belt, and Kindersley, representative of the heavy land in the west central portion of the province. In 1931, in coöperation with the Canadian Pioneer Problems Committee and the Agricultural Economics Branch of the Department of Agriculture, Ottawa, two more

TABLE 1.—*Cost of production per acre of wheat for 801 Saskatchewan farms. Saskatchewan farms surveys, Crop years 1926-29.*

Cost per acre (Dollars)	Moose Jaw		Melfort		Alameda		Swift Cur'nt		Kindersley		Turtleford		Six Areas	
	No. of farms	Per cent of total	No. of farms	Per cent of total	No. of farms	Per cent of total	No. of farms	Per cent of total	No. of farms	Per cent of total	No. of farms	Per cent of total	No. of farms	Per cent of total
2.10 to 6.00	..	..	1	1.0	3	3.2	1	1.1	3	1.4	..	..	8	1.0
6.10 to 10.00	..	..	1	1.0	17	18.3	3	3.2	6	2.8	2	1.1	29	3.6
10.10 to 14.00	..	..	8	7.7	22	23.7	9	9.5	52	24.2	19	10.8	110	13.7
14.10 to 18.00	6	5.1	11	10.6	28	29.9	20	21.1	62	28.6	26	14.8	153	19.1
18.10 to 22.00	17	14.4	16	15.4	18	19.4	26	27.1	52	24.2	44	24.9	173	21.8
22.10 to 26.00	37	31.5	20	19.1	2	2.2	21	22.1	21	9.8	29	16.5	130	16.2
26.10 to 30.00	20	16.9	20	19.1	1	1.1	7	7.4	7	3.3	19	10.8	74	9.2
30.10 to 34.00	17	14.4	11	10.6	1	1.1	4	4.2	4	1.9	16	9.1	53	6.6
34.10 to 38.00	9	7.6	6	5.8	..	..	2	2.1	1	.5	9	5.1	27	3.4
38.10 to 42.00	5	4.2	2	1.9	..	..	1	1.1	3	1.4	5	2.8	16	2.0
42.10 to 46.00	4	3.4	3	2.9	1	1.1	1	1.1	2	.9	4	2.3	15	1.9
46.10 to 50.00	3	2.5	2	1.9	..	..	..	..	1	.5	..	..	6	.7
50.10 to 54.00	..	..	1	1.0	..	..	..	..	1	.5	1	.6	3	.4
54.10 to 58.00	..	..	1	1.0	..	..	..	..	..	..	1	.6	2	.2
58.10 to 62.00	..	..	..	..	..	..	..	..	..	..	..	..	..	..
62.10 to 66.00	..	..	..	..	..	..	..	..	..	..	1	.6	1	.1
66.10 to 70.00	..	..	1	1.0	..	..	..	..	..	..	..	..	.1	.1
Total number of farms	118	100.0	104	100.0	93	100.0	95	100.0	215	100.0	176	100.0	801	100.0

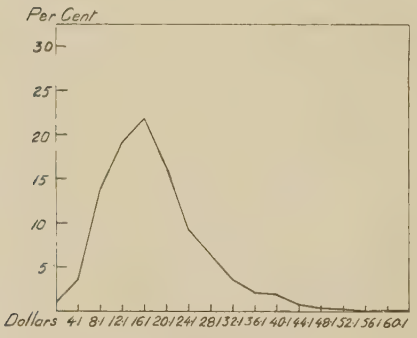

Figure 3.

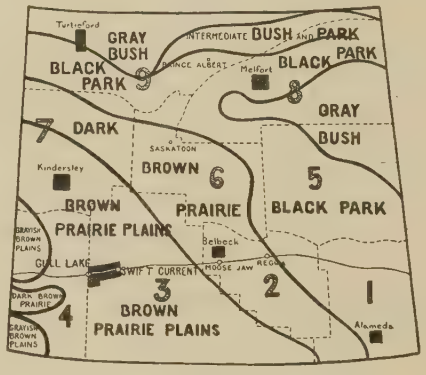

Figure 4.

Figure 3. Percentage distribution of 801 farms in Saskatchewan according to Cost of Production Per Acre of Wheat. Six Areas 1925-1929.

The simple average cost per acre of wheat for the 801 farms was \$21.90 ± .214. The mode or most typical cost for these farms was \$19.90 and the average cost weighted on a total acreage gasis was \$19.60. The average cost per bushel was \$1.09 with 18.2 bushels as the average number of bushels of wheat sold per acre.

MAJOR SOIL BELT OF SASKATCHEWAN

Figure 4. The heavy lines indicate the approximate boundaries of the major soil belts as outlined by the Department of Soils, University of Saskatchewan. The numbers refer to the crop districts, as used by the Provincial Department of Agriculture, the boundaries of which are shown with dotted lines. The blocked sections at Belbeck, Melfort, Alameda and Swift Current-Gull Lake show the areas included in farm business studies of which reports have been completed. Field work of studies at Turtleford and Kindersley was done in 1930, and reports are in process of preparation for publication.

areas were studied, Davidson, situated in a medium soil district in the central part of Saskatchewan, and Maple Creek, typical of some of the lighter land in the south west. The last two studies are at present in process of tabulation.

In table 1 data on cost of production per acre for the first six studies are presented for analysis. Cost of production per acre is used in preference to cost per bushel, because of its greater significance. The data for each of the six areas and the combined data for the six areas appear in figures 1, 2 and 3. A few farms have been left out of the tabulation because particular circumstances produced costs decidedly out of the distributions. None of the curves, except perhaps that for Swift Current (figure 1), even approach the normal bell-shaped curve of error. Like many curves of economic data they are decidedly skewed towards the high values. In this respect they resemble income curves.

The curves for the three areas, Swift Current, Moose Jaw and Kindersley, are characterised by relatively greater bunching of the value than are the curves for the other three areas (figure 1). These former three districts have one characteristic in common, a high percentage of total cash receipts from wheat (table 2). Moose Jaw has 88 per cent, Swift Current 86.9 per cent and Kindersley 67.3 per cent of the cash receipts from wheat sales. The curves of the other three areas, Alameda, Melfort and Turtleford (figure 2) are characterized by a greater degree of asymmetry. These three areas are typical of the Park Belt and have a greater diversity of cash receipts than the other studies (table 2).

TABLE 2.—*Sources of cash receipts for 821 Saskatchewan farms. Saskatchewan farm surveys, crop years, 1926-29.*

Source	Moose Jaw Per cent	Melfort Per cent	Alameda Per cent	Swift Current Per cent	Kindersley Per cent	Turtleford Per cent	Six areas Per cent
Wheat	88.0	79.0	61.1	86.9	67.3	55.8	76.2
Coarse grains	4.1	9.9	20.7	4.5	9.0	9.1	8.6
Livestock sales	3.4	5.6	8.4	3.1	6.5	14.0	5.8
Livestock products	1.6	1.6	3.4	0.8	2.9	7.8	2.5
Threshing receipts	2.5	3.0	4.6	4.6	5.8	6.4	4.2
Other	0.4	0.9	1.9	1.0	8.5	6.9	2.7
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The curve for Kindersley, although skewed considerably towards the high values shows a comparatively high concentration of farms producing wheat at similar costs. In the crop year studied the average number of bushels of wheat sold per acre was only 11.9. The price of wheat was also comparatively low. Had conditions been more nearly normal that year, the receipts from wheat sold would have formed a somewhat larger percentage of the total cash receipts.

When all the farms are put together in one distribution a smooth curve results which is distinctly asymmetrical (figure 4). It will be noticed that there are some farms with costs around $4 to $8 per acre. These are probably farms whose costs have been lowered by very profitable enterprises or large threshing receipts. However these low costs are balanced or offset by the high costs of a few farmers. It will be noticed from table 1 that there are 3.4 per cent of the farms with costs more than $42 per acre.

TABLE 3.—*Various statistical measures of the cost of production per acre of wheat. Saskatchewan farm surveys, crop years, 1926-1929.*

Area	No. of farms	Simple mean (dollars)	Weighted mean (dollars)	Mode (dollars)	Standard deviation (dollars)	Co-efficient of variability per cent	Co-efficient of skewness	Relative P. E. per cent	4 times relative P. E. per cent
Moose Jaw	118	27.80±.449	26.0	24.30	7.23	26.0	+.484	±1.5	± 6.0
Kindersley	215	18.20±.324	16.10	16.10	7.04	38.7	+.298	±1.8	± 7.2
Turtleford	176	23.70±.458	20.70	20.20	9.00	38.0	+.389	±1.9	± 7.6
Swift Current	95	20.80±.465	18.80	20.10	6.70	32.2	+.104	±2.2	± 8.8
Melfort	104	25.90±.668	23.20	24.30	10.10	38.9	+.158	±2.6	±10.4
Alameda	93	14.80±.414	15.50	15.90	5.92	39.9	−.186	±2.8	±11.2
All areas	801	21.90±.214	19.60	19.90	8.90	40.7	+.225	±1.0	± 4.0

	Bushels of wheat sold per acre		Bushels of wheat sold per acre
Moose Jaw	25.9	Melfort	19.2
Swift Current	23.0	Kindersley	11.9
Alameda	23.3	Turtleford	11.5
		All farms	18.2

Average cost per bushel sold—all farms: $1.09.

The Moose Jaw area had the highest average cost per acre, $27.80 ± .449 (table 3). The average cost weighted by acres of wheat was $26, and the average number of bushels sold per acre was 25.9. The mode, the most frequent or typical cost, was $24.30. This area had the highest percentage of receipts from wheat but also the highest yield per acre. The lowest average cost per acre was for the Alameda area, $14.80 ± .414. The weighted cost was $15.50, and the mode $15.90. This area had only 61 per cent of the total cash receipts from wheat. A simple correlation between cost per acre and the percentage which non-wheat cash receipts are of total cash receipts reveals a low coefficient of —.25 ± .0207. There is some indication that receipts other than wheat tended to lower the costs of producing wheat that year at Alameda.

The simple average cost per acre for all the farms in all districts was $21.90 ±.214, and the weighted average cost, $19.60. There is a tendency for the larger farms to have lower costs per acre, which lowers the average figure when weighted according to acreage. The modal cost for all farms was $19.90. It is interesting to note that in all cases, excepting Kindersley,

the value of the mode is between the weighted mean and the simple mean, and usually very close to the former. In other words we can say that the true weighted mean cost is usually the most typical cost.

The variability within the samples themselves is indicated by the coefficients of variability (table 3). It will be noticed that the two areas having relatively the largest wheat business, Swift Current and Moose Jaw, show the smallest variability in costs per acre. The greatest variability (39.9) is in the case of the Alameda district, which has about the greatest diversity of enterprises of all areas. The amount of the displacement of the various curves from the normal distribution, or the amount of asymmetry is indicated by the coefficient of skewness (Karl Pearson's formula $Sk = \frac{Ma - Mo}{\sigma}$). All the curves except Alameda have a positive skewness, showing the pull to the curves exerted by the few farms with very high costs.

The areas in table 3 are arranged in order of the relative probable error. (R. P. E. $= \frac{P.\ E. \times 100}{Ma.}$). The smallest relative probable error is in the case of Moose Jaw, and the largest is for Alameda. Except for Kindersley and Turtleford, the greater the coefficient of variability the greater is the relative probable error. With the number of farms fairly constant in the first four areas this is to be expected from the formula P. E. of the mean $= \frac{.6745\ \sigma \text{ of the sample}}{\sqrt{N}}$. In the case of Turtleford and Kindersley, although the coefficients of variability are as large as Melfort and Alameda yet the relative probable errors are only $\pm$ 1.8 and $\pm$ 1.9, compared with $\pm$ 2.6 and $\pm$ 2.8 for the latter. This is due to the larger number of farms sampled at Kindersley and Turtleford.

The reliability that could be placed on an average of a sample depends upon the variability of the sample itself and upon the number of observations in the sample[2]. The formula for the P. E. of the mean of a sample can be stated in another form with respect to the relative P. E.

$$\text{R. P. E.} = \frac{\text{P. E.} \times 100}{\text{Ma.}}$$

$$= \frac{\frac{.6745\ \sigma \times 100}{\sqrt{N}}}{\text{Ma.}}$$

$$= \frac{.6745\ \sigma \times 100}{\sqrt{N \times \text{Ma}}}$$

$$= \frac{.6745 \times \text{coeff. of Var.}}{\sqrt{N}}$$

Thus we can say, if the coefficient of variability remains the same, in order to decrease the relative probable error by one half, the sample

[2]The formula for the probable error of a single observation only applies where the distribution is normal. It has been shown that provided the principles of random sampling are strictly adhered to the means of successive samples from skewed distributions will themselves fall in a normal curve. For this reason the above formula for the probable error of the mean of a random sample is applicable here.

has to be four times as large. It would seem that, in order for the cost data from an area of relatively greater diversification to be as reliable as data from a specialized wheat area, the sample would have to be about twice as large.

The interpretation of the last column (table 4) would be that the chances are 142 to 1, or almost certainty, that the obtained averages are within four times the obtained relative probable error of the true mean for the universe. Or to express it in a different manner for the 801 farms, if the studies were repeated under exactly similar conditions (which is rarely possible) it is almost certain that the new average figure obtained would not vary by more than $\pm$ 4 per cent from $21.90.

It is not assumed that the simple average obtained for the 801 farms, $21.90, or the weighted average of $19.90 is precisely representative of the whole province. However, because of the widely scattered areas studied, both in the Park Belt and in the more concentrated wheat areas, taking into consideration the large number of farms included, and the low relative probable errors, it is suggested that for the period studied the above cost data give a very reliable indication of the probable cost of production of wheat per acre with the average yield obtained on these farms.

NOUVELLE METHODE DE SOLUBILISATION DU PHOSPHATE TRICALCIQUE

Note de MM. Pierre Jolibois et Georges Chaudron, présentée à l'Académie des Sciences de Paris, par M. Henry LeChatelier.

On sait que le phosphate tricalcique naturel ne se prête pas aux besoins agricoles sans avoir subi un certain nombre de transformations. Parmi celles-ci la plus connue consiste à traiter le phosphate par l'acide sulfurique.

Cette méthode présente toutefois quelques inconvénients: d'abord celui d'exiger la préparation d'une matière inutile et quelquefois même nuisible, l'acide sulfurique, ensuite celui d'augmenter la dilution du principe fertilisant dans le produit fabriqué et enfin celui de répandre sur le sol une matière dont l'acidité est souvent nuisible pour le transport et la culture.

Nous avons mis au point une méthode nouvelle qui, tout en n'exigeant que des réactions simples se produisant dès la température ordinaire, fournit de l'acide phosphorique soluble sous une forme qui ne se prête pas aux critiques signalées plus haut.

Le principe de cette méthode consiste à traiter en milieux aqueux à la température ordinaire, par du chlorure de plomb, le phosphate tricalcique naturel. Une petite quantité d'acide chlorhydrique est nécessaire pour donner au bain une légère acidité et pour neutralisser les carbonates naturels.

Dans ces conditions, le phosphate tricalcique se transforme en chlorophosphate de plomb insoluble de formule

$$PbCl^2,3\ (P^2O^5 — 3\ PbO).$$

Les eaux-mères contiennent la presque totalité du calcium à l'état de chlorure, et elles atteignent, une fois la réaction terminée, une concentration de 150 g $CaCl^2$ par litre.

Quand l'acidité reste faible, en présence d'un excès léger de chlorure de plomb, la quantité de phosphore contenue dans les eaux mères est minime. On y trouve, en outre, la quantité de chlorure de plomb correspondant à la faible solubilité de ce sel. Il est très facile de récupérer cette faible quantité de plomb au moyen d'un lait de chaux ajouté en proportions calculées, après quoi, on élimine définitivement les eaux mères chargées de chlorure de calcium.

Le chlorophosphate de plomb peut servir de véhicule à l'acide phosphorique grâce à l'insolubilité d'un certain nombre de sels de plomb.

Parmi quelques solutions possibles de la fabrication de phosphates alcalins solubles, en se servant de chlorophosphate comme matière intermédiaire, nous avons retenu le processus suivant qui présente un intérêt pratique:

Lorsqu'on traite le chlorophosphate par de l'acide nitrique de différentes dilutions, on obtient une solution de diverses substances en équilibre chimique. Les mesures que nous avons effectuées à la température ambiante nous ont donné, comme composition de la solution, les nombres suivants:

Concentration initiale de l'acide nitrique (en gr/lit)	687	350	236
NO^3 (en gr/lit)	145	172	188
P^2O^5 (en gr/lit)	332	101	59
Pb (en gr/lit)	13	42	73

Comme on peut le voir, la proportion de plomb va en diminuant dans la solution quand la concentration de l'acide nitrique initial augmente.

On a donc intérêt à traiter le chlorophosphate par de l'acide nitrique assez concentré qui laisse la presque totalité de plomb à l'état de nitrate de plomb insoluble dans ce milieu et qui donne une solution finale contenant jusqu'à 300 g de P^2O^5 par litre.

Le nitrate de plomb isolé est traité par du chlorure de potassium en quantité équivalente; on récupère ainsi la presque totalité du chlorure de plomb qui rentre dans le cycle et l'on obtient du nitrate de potassium. Le reste du plomb se trouve en solution nitrique.

En neutralisant par de l'ammoniaque cette solution, on obtient une petite quantité d'un précipité de phosphate de plomb qu'il est facile de faire revenir en fabrication.

La liqueur filtrée est constituée par une solution de phosphate d'ammonium et de nitrate d'ammonium.

On voit donc que ce procédé, que nous avons étudié dans tous ses détails, permet d'obtenir, sans grande dépense d'énergie et sans disparition de matières premières précieuses, les substances suivantes:

1o) Dunitrate de potassium;

2o) Un mélange de phosphate d'ammonium et de nitrate d'ammonium. L'extraction de 1 kg d'anhydride P^2O^5 met en jeu les quantités de substances suivantes:

Phosphate tricalcique du Maroc	3 kg
Acide chlorhydrique	0,5
Eau	50
Chlorure de plomb (rentrant entièrement dans le cycle)	6
Acide nitrique (densité 1, 32)	6
Ammoniaque (compté en NH^3)	0,33

Les produits définitifs sont constitués par les engrais composés suivants:

1o Nitrate de potassium	4 kg
2o Mélange de phosphate d'ammonium	1,6
et de nitrate d'ammonium	0,1

Le cycle que nous venons de décrire est un de ceux qui nous paraissent avantageux et que nous avons déjà réalisé pratiquement avec une quantité importante de matière. Mais il convient surtout de retenir que le chlorophosphate de plomb est un composé facile à préparer à partir du phosphate tricalcique. Grâce à l'insolubilité de certains sels de plomb, il possède une aptitude réactionnelle fort intéressante pour la fabrication des phosphates solubles sans aucune perte de plomb.

RESUME DES ARTICLES PUBLIES EN ANGLAIS DANS CE NUMERO

La Valeur Comparee du "Roughage" non Prepare, Coupe, et Moulu, pour L'Engraissement des Veaux. A. M. Shaw et J. W. G. MacEwan, Université de la Saskatchewan.

Une expérience fut conduite avec quarante bonnes génisses de race Hereford élevées en liberté sur la prairie. Le "roughage", constitué par du foin de prairie basse, par des gerbes d'avoine et par du foin de légumineuses, fut coupé ou moulu par des moulins de trois types différents. Les génisses furent divisées en quatre groupes, trois groupes recevant le "roughage" préparé tandis que le quatrième groupe, servant de témoin, recevait du "roughage" non coupé.

La conclusion générale est qu'il y a plus de perte lorsque les animaux sont nourris avec du "roughage" coupé long ou non coupé. Si cette perte pouvait être contrôlée au moyen de mangeoires ou de crêches spécialement préparées, il semble que la préparation du "roughage" présenterait peu d'intérêt. Bien que les différences entre les groupes en gain total ou en vitesse de gain soient de peu d'importance, les gains les plus économiques furent ceux du groupe recevant le "roughage" coupé avec un moulin du type ordinaire des hacheurs de paille.

Le Melange des Varietes de Ble Commercial et Son Effet Sur les Qualites de Mouture et de Boulangerie. Compilé par J. B. Harrington, Université de la Saskatchewan.

Cette étude rapporte le résultat d'une enquête coopérative sur la pureté d'échantillons commerciaux de blé rouge dur de printemps canadien à la suite des critiques qu'on en a faites en 1927 et 1928. L'enquête fut conduite sous les auspices de la Société d'Agronomie de l'ouest du Canada avec la coopération d'agences gouvernementales et des "wheat pools" de la Saskatchewan et du Manitoba.

Les résultats montrent que la pureté au point de variété des blés de haute qualité du Manitoba et de la Saskatchewan dépasse 90% à toutes les étapes depuis l'époque des semailles jusqu'à l'arrivée des cargos à leur destination.

Des épreuves de mélange, de mouture et de boulangerie ont montré que le mélange des variétés qui avaient pu se produire n'avaient pour ainsi dire pas d'importance en raison de la haute teneur en azote de tous le échantillons.

Methode D'Estimation du Poids Moyen Annuel des Oeufs. A. J. G. Maw et W. A. Maw, Collège Macdonald, P.Q.

Les chiffres sur lesquels cette étude est basée, proviennent des dossiers de 74 poulettes Leghorn blanches à crête simple, écloses en mars et avril. L'âge moyen auquel la ponte a commencé est de 180.2 jours. Les conclusions obtenues sont les suivantes:

"Il y a augmentation graduelle du poids des oeufs pondus par ces poulettes jusqu'à la fin de la première année.

Un nombre considérable de volailles ne pondent pas d'oeufs de poids normal (56.7 grammes) pendant leur première année. Les volailles dont les dix premiers oeufs pèsent en moyenne moins de 47.50 grammes ne ponderont probablement pas d'oeufs de poids normal. La pesée des 10 premiers oeufs du cinquième mois donne un estimé raisonnable du poids moyen annuel des oeufs."

La Renaissance des Arts Rustiques. Georges Bouchard, M.P., Ecole d'Agriculture, Sainte-Anne de la Pocatière, P.Q.

Le Dr. Bouchard s'attache à mettre en relief la valeur sociale et économique des arts domestiques. On devrait s'attacher à produire des objets artistiques plutôt qu'à essayer de concurrencer des articles d'utilité fabriqués à la machine. Une technique moderne et des accessoires mécaniques des arts rustiques devraient être développés par les écoles et les fermes d'expérimentation. La classification et la coopération devraient être pratiquées dans la vente des objets fabriqués à domicile. On devrait apprendre aux enfants à apprécier les arts domestiques, et des campagnes d'annonces devraient être entreprises par des particuliers, des hoteliers, des compagnies de transport, etc.

Les experts dans les différentes phases des arts rustiques devraient coopérer pour produire en un volume une étude englobant tout le sujet au Canada. Jusqu'ici aucun effort n'a été fait dans ce sens. Un traité intéressant de cette question révèlerait au public des trésors étonnants.

La Reprise des Affaires. J. E. Lattimer, Collège Macdonald, P.Q.

Le Dr. Lattimer observe qu' "un des plus grands obstacles à la reprise des affaires est la façon arbitraire dont on contredit les lois de l'économie politique et du bon sens." Parmi ces interventions arbitraires, il faut inclure l'extension exagérée du crédit international, l'absence de liberté du commerce entre les différents pays conduisant à une mauvaise distribution de l'or, des essais de stabilisation des prix conduisant à la surproduction, et les primes données aux surplus. Le sophisme de ces mesures s'affirme graduellement et les choses s'arrangent d'elles-mêmes lentement grâce à l'action des lois économiques établies.

En raison du fait que les diminutions de prix ne sont jamais uniformes dans les différentes industries et entreprises les affaires sont retardées plus qu'elles ne le devraient. "Le manque actuel d'uniformité dans les prix est une cause majeure du retard dans la reprise des affaires". Un réajustement est en train de se faire et les correctives naturelles nécessaires entreront en jeu.

Les Parasites des Oiseaux Sauvages dans la Province de Quebec. J. A. Rayner, Collège Macdonald, P.Q.

L'abondance d'oiseaux sauvages autour des poulaillers du Collège ont provoqué cette étude pour déterminer s'il pouvait y avoir là une cause de transmission des maladies des volailles.

Des listes de parasites collectionnés et déterminés sont données. On suggère que la présence du *Liponyssus sylviarum* parmi les oiseaux sauvages explique son apparence soudaine dans les poulaillers isolés. Jusqu'ici on n'a pas de preuve qu'aucun des parasites internes des volailles puissent utiliser comme hôte aucune des neufs espèces d'oiseaux examinés.

Remarques des Donnees se Rapportant au 'Cout de Production du Ble'. E. C. Hope, Université de la Saskatchewan, Saskatoon.

Cette étude se rapporte à des méthodes statistiques utilisées dans des études antérieures du Dr. William Allen, professeur d'économie rurale à l'Université de la Saskatchewan, dans son enquête sur la direction des exploitations agricoles dans les diverses parties de la province. La conclusion en est que les méthodes utilisées sont correctes et que l'erreur probable dans l'estimation du coût de production du blé par arpent est de plus ou moins 4% du chiffre auquel le Dr. Allen est arrivé dans dans ses études. Comme la moyenne arithmétique pour les 201 fermes étudiées se chiffre à $21.90 ou peut voir que l'erreur probable n'a pas une grande importance.

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CURRENT PUBLICATIONS

41. Bailliere's Encyclopaedia of Scientific Agriculture. Edited by Dr. Herbert Hunter of Cambridge University. Published by Baillière, Tindall and Cox, London, England. 2 vols. Price 63s net.

The preface states that "the object of this Encyclopaedia is to present the various branches of agriculture in the new aspect they are assuming under the influence of scientific inquiry, and to outline the changes in former practice rendered possible and necessary in the light of the new knowledge". This work differs from the usual "Encyclopaedia of Agriculture" in that it assumes that the reader has an understanding of "husbandry". It endeavours to bring into "proper relation to practice the rapidly increasing mass of valuable information contained in scientific journals and pamphlets".

In addition to general definitions of scientific terms and description of phenomena, there is a great amount of historical, economic and social data. A survey of the agricultural development of the nations of the British Empire is given by a leading authority on each.

Those who are interested in the status of the farmer in the British Isles will find much information concerning legal and economic aspects of labour, tenantry, small holdings, farm capital and farming systems. Articles on various farm crops include economic information as well as details on breeding, disease, and methods of production. Scientific advances in the feeding of live stock are fully discussed.

The Encyclopaedia should be in all Canadian University and Public Libraries and in many of the private libraries of research workers, administration officials, editors and farmers who desire to have a general understanding of the scientific forces that are shaping the destiny of the next few decades of British and Dominion agriculture. Most of the scientists on the staffs of the various Imperial Bureaux are contributors, and their relationship with Dominion workers has given a broad viewpoint to their contributions. It is a pleasure to note the many references to papers published in *Scientific Agriculture* and the *Canadian Journal of Research* by Canadian technical agriculturists.

42. Vegetable Crops. By Homer C. Thompson, Ph.D., Professor of Vegetable Crops, New York State College of Agriculture, Cornell University. (Published by McGraw-Hill Book Co., Inc. New York and London 1931. Price $5.00).

This treatise on the production of Vegetable Crops will, without doubt, be found of great value to the instructor and student, as well as the grower of truck crops. The pages of this volume are filled with the deductions drawn from experimental work that has a definite bearing on crop production, and while the experimental work, from which the compilation work was done, was carried out in the United States, the principles involved are so much like those affecting crop production in many parts of Canada that the data supplies a very useful and accurate basis for teaching the science side and the practical growing of certain of those crops adapted to Canadian conditions.

The vegetable industry has developed at an enormous rate in the United States, as well as the transportation facilities to handle the large bulk of produce being shipped each year from distant growing centres to American and Canadian markets.

Owing to the value of vegetable foods in the diet, the population of the United States and Canada has learned to use a large volume of vegetables. In the first chapter the author deals with the above phases and shows the relation and importance of this branch of agriculture to several of the others.

Since classification of vegetables is of great importance, this is dealt with in a very concise manner from a botanical as well as from the standpoint of hardiness, usable parts and adaptation to cultivation.

One chapter is devoted to each of the following headings: Manures, Soil Improving Crops and Commercial Fertilizers. The use of lime as a soil amendment is also discussed. Since so much depends upon the management of the soil these chapters show the importance of proper treatment for the maintenance of good tilth and soil fertility. In that portion devoted to Manure Economy Experiments it is shown that with cabbage a combination of

green manure crops and chemical fertilizers produced larger yields than 32 tons of manure, over a period of nine years. Many other points of value are discussed which have a similar bearing on other crops.

The value of good seed, longevity, source of supply and seed growing is treated very fully.

The chapter dealing with growing plants in hotbeds, cold frames and greenhouses embodies a lot of valuable information regarding the management as well as the advantages and disadvantages of transplanting. The construction of plant forcing beds and houses is dealt with to a considerable extent.

Plant growing in the open and cultivation is outlined fully and dealt with in a comprehensive way. The time, date, method, and rate of planting, watering and plants per acre, has been prepared in a clear fashion. It has been shown that cultivation is beneficial due to weed control. Scraping the surface of the ground to control weed growth produced as good results with cabbage as where deep cultivation had been practiced. Celery gave the greatest response to cultivation. Paper mulch has been beneficial with certain crops.

Under the heading of irrigation the different types or systems are discussed, including the average cost of spray irrigation per acre in New Jersey.

The problem of rotation, succession and intercropping has been a difficulty to many growers, but in the chapter dealing with this it is made quite clear how the different crops influence the succeeding ones.

Disease and insect control are fully outlined, giving the most up-to-date methods.

Marketing is dealt with covering grading and packing, as well as the storage of vegetables for future sale.

From chapter XVI to XXVII which is the concluding chapter, the crops are grouped under such headings as Perennial Crops, Pot Herbs or Greens, etc., and dealt with in a clear and instructive manner.

To fully appreciate the value of this text it should be read by those interested in teaching the science of vegetable crop production, as well as by the practical grower, because of the vast amount of indispensable ideas embodied in the pages of this book that have been gleaned from the results of actual experimental work. This book fills a long felt need. T.F.R.

43. Notes on Tulip Species. By the late W. R. Dykes, M.A., edited and illustrated by E. Katherine Dykes. Published by Herbert Jenkins Ltd., London. Price $40.00. Available from the Department of Agriculture Library, Ottawa.

This is the modest title of a fine quarto volume of 108 pages and 54 beautifully coloured plates of tulip species. The author of the notes, the late W. R. Dykes, was for a number of years Secretary of the Royal Horticultural Society and a specialist on tulip species. The coloured illustrations have been made by his wife.

There is great interest in rock gardens in Canada at present, and many of the species of tulips are very suitable subjects for such gardens. In this book detailed descriptions are given of each species, with observations on its behaviour in England. There are many synonyms of tulip names, and these are given here, as well as the distribution of the species. The illustrations, however, are what will appeal to the average person as they bring out in a marked degree the charm of these lovely flowers. W.T.M.

44. Dioecious Maize. Jones, D. F. Science 73: 432.

The maize plant is normally a monoecious plant having separate pistillate and staminate flowers. Mutant forms have occurred which produce a complete change in these floral parts. A gene called silkless is known which, as the name implies, causes a failure to produce silk and consequently no seed develops on the pistillate shoot. Another gene called tassel-seed converts the normal pollen-producing flowers in the terminal tassel to pistillate flowers.

Since these two genes are known to be in separate linkage groups a cross between the two would be expected to give the normal dihybrid ratio in F_2. Somthing closely approaching this actually occurs except that the double recessive, expected in one out of sixteen, fails to appear altogether. Extensive trials have shown that the gene for tassel-seed when homozy-

gous nullifies the effect of the gene for silk-less and thus the double-recessive form does not differ in appearance from the singly recessive type.

Further tests showed that when this double-recessive form was crossed with a plant homozygous for silk-less but heterozygous for tassel-head that only two types of offspring resulted, viz. male and female and these in approximately equal numbers. The female plant bears pistillate flowers in both the ear and tassel shoots while the male is silk-less and hence has no functional pistillate flowers but does have a normal pollen-producing tassel.

With this result a dioecious strain has been produced from a monoecious species and an hermaphroditic organism has changed to one with two separate sexes. This illustration also furnishes a striking example of the interaction of the genes and may possibly throw some light on the evolutionary process. L. C. R.

45. A Direct Quantitative Relationship Between Vitamin A in Corn and the Number of Genes for Yellow Pigmentation. Mangelsdorf, P. C. and Fraps, G. S. Science *73*: 241-242.

Yellow corn, which carries the carotinoid pigment, has been known for some time to be richer in vitamin A than is white corn.

Corn, like many of the higher plants, undergoes a double fertilization resulting in the endosperm being 3 N tissue having received two maternal nuclei plus the male nucleus. Four different types of endosperm, having reference to the concentration of the yellow pig, ment, may therefore occur, viz. YYY, YYy, Yyy, and yyy proceeding from intense yellow to white.

By making appropriate crosses the authors were able to accurately separate a sufficient supply of the four different classes. The vitamin assay was made by feeding to albino rats by the Sherman-Munsell unit method. The tests were repeated for two years and showed a high degree of relationship. Each gene for yellow formed approximately 2.5 units of vitamin per gram of seed.

Attention is called to the bearing that this investiigation has on the nature of a gene. The idea that it is enzymatic in its action is thought unlikely since the proportion between the rate of reaction and the concentration is usually not as direct a one as is indicated in this work. More weight is given to the belief that it is indicative of a direct chemical reaction between the gene and some other substance in the endosperm.

This is believed to be the first case where a direct quantitative relationship has been shown between different doses of the same gene and their chemical effect. L.C.R.

46. Conference Papers. International Dairy Congress, Copenhagen, 1931. English Edition. Available from the Department of Agriculture Library, Ottawa.

These papers have been printed in five separate paper bound volumes, as follows:

1st Section. Dairy Cattle Breeding and Milk Production. Papers Nos. 1-36 including "The effect of different planes of protein intake on milk production," by Savage and Harrison of Cornell University; "The nutritive requirements of the dairy cow expressed in accord with a new method of application of the net energy concept," by Forbes and Kriss, Pennsylvania State College; and many papers by other American and European authorities.

2nd Section. Chemistry, Bacteriology and Hygiene. Papers Nos. 37-77 including two by Hood and White on "An a-typical Escherichia coli producing bitter milk" and, "A study of methods for determining numbers of moulds and yeasts in butter."

3rd. Section. Technique, Industry and Trade. Papers Nos. 78-105 including a paper by Ruddick and Singleton on "The trend of the dairying industry and trade in Canada."

4th Section. Organization, Legislation, and Control. Papers Nos. 106-129 by American and European authorities including "International butter", by Thomson.

5th Section. Tropical Dairy Industry. Papers Nos. 130-135 touching on conditions in India, Japan, British East Africa, and the West Indies.

CONCERNING THE C.S.T.A.

CONVENTION AT WINNIPEG IN 1932

In cooperation with the Canadian Seed Growers' Association, the Canadian Society of Technical Agriculturists has accepted the invitation of the Manitoba branches of the C.S.G.A. and the C.S.T.A. to hold their annual conventions in the City of Winnipeg in June, 1932. Following two successive conventions in Eastern Canada it is now planned to hold two in Western Canada as the 1933 Convention will probably be held in Saskatchewan in connection with the World's Grain Exhibition. Affiliated Societies and other organizations with mutual interests will be invited to hold their annual conventions in connection with the C.S.T.A. convention. The week of June 13th has been tentatively selected as a suitable date. It has been suggested that the C.S.G.A. meet the 13th, 14th and 15th, and the C.S.T.A. and affiliated organizations the 16th, 17th and 18th. To economize in both time and expense it is planned to limit the convention to one week. Accommodation has been offered by the Manitoba Agricultural College and the University of Manitoba. The planning of programmes has already started and an endeavour is being made to secure outstanding lecturers for the occasion.

PROFESSIONAL INSTITUTE OFFICERS

Technical agriculturists are well represented on the executive of the Professional Institute of the Civil Service of Canada. The retiring President, Mr. L. S. McLaine, Chief of the Division of Foreign Pests Suppression, Dominion Entomological Branch, Ottawa, has held the chair for two years. He is succeeded by Dr. E. S. Archibald, Director of the Dominion Experimental Farm System, Ottawa. It is a matter of pride to the Canadian Society of Technical Agriculturists to see a former President of the Society, Dr. Archibald, succeed to the Presidency of the Professional Institute. On two other occasions, technical agriculturists have been Presidents of the Institute in the persons of Dr. J. M. Swaine, and Dr. Gordon Hewitt. Agriculturists are also represented on the 1932 Executive by Dr. A. E. Cameron, 3rd Vice President, and Mr. C. R. Twinn, Assistant Secretary. The Professional Institute is approximately the same size as the C.S.T.A., having between thirteen and fourteen hundred members.

LUNCHEONS IN MONTREAL

The newly formed Montreal City Local of the C.S.T.A. has again commenced its weekly luncheons. The day of meeting has been changed to Monday noon, and the place is changed from Krausman's to the Samovar Restaurant, on Peel Street, just above St. Catherine.

It is to be hoped that any members of the C.S.T.A. who may chance to visit Montreal will try to attend these informal gatherings. The Secretary is O. R. Evans, Montreal Star Publishing Company.

C.S.T.A. PRESIDENT TOURING WEST

Mr. H. S. Arkell, President of the C.S.T.A., is making a business trip through Western Canada in the course of which he will speak at meetings of several of the western branches of the Society. Following his return to Ottawa, he will visit branches in Quebec and Ontario. He may be accompanied on these latter visits by the General Secretary, H. L. Trueman, who has returned to his work at the Society headquarters.

Miss M. Dewan, Assistant to the General Secretary, who has carried a considerable part of the load during the past six months, is taking a short holiday.

ANNUAL FEES DUE

Included in the June, 1931, issue of Scientific Agriculture was a statement on a separate slip to the effect that the annual membership fee of five dollars was due on June 1st. No further bills have been sent out from the Society headquarters and a fairly good proportion of the year's membership fees have been received. There are many, however, who have not yet paid and bills are being forwarded to these members during the month of January. It will greatly assist in the financing of the Society during the winter months if these fees are paid promptly upon receipt of the notice.

CANADIAN COUNCIL ON BOYS' AND GIRLS' CLUB WORK

The first of the national boys' and girls' agricultural club contests to be conducted under the direction of the Canadian Council on Boys' and Girls' Club Work was held at the Royal Winter Fair in Toronto in November last.

For a number of years trips to the Royal Winter Fair have been provided by the Canadian railway companies for cattle and swine club teams. Under the new arrangements the contests were extended to include cattle, swine, potato and grain club teams. In each case the teams competing at Toronto were the winners of Provincial elimination contests.

Twenty teams, of two members each, participated in the contests under the four projects mentioned. Eight Provinces were represented in the cattle competitions, seven in the swine competitions, three in the potato competitions and two in the grain competitions. One other grain club team was expected but the entry was withdrawn. The contests under each project included a judging competition and an oral examination.

The membership of the Council includes all of the Departments of Agriculture in Canada, Dominion and Provincial, and such business organizations as may be willing to become members. Departmental grants to the Council are used to cover the expenses of administration while the subscriptions of business institutions are ear-marked definitely for the purposes of the national club contests. The programme of contests for 1931 was made possible because of the membership subscriptions of the Canadian National Millers Association, the Canadian National Railways, the Canadian Pacific Railway, the Dominion Steel and Coal Corporation, Eastern Dairies Limited, and the Industrial and Development Council of Canadian Meat Packers. The confidence thus shown by these business institutions in the boys' and girls' club movement is greatly appreciated by those who are directly connected with club work and by all who are interested in the development of Canadian agriculture.

The first annual meeting of the Council was held in Toronto on November 18th. Mr. R. S. Duncan, the Chairman of the Council, presided. One of the important resolutions adopted at that meeting was concerned with representation on the board of directors. It was decided that the board should consist of nine members, instead of five as suggested in the report of the special committee which formed the basis of organization. The election of directors for 1932 resulted as follows;

Representing Provincial Departments of Agriculture.

Dr. W. V. Longley, Director of Extension,
Nova Scotia Agricultural College,
Truro, N.S.

Mr. J. H. Lavoie, Director, Horticultural Service,
Department of Agriculture,
Quebec, Que.

Mr. R. S. Duncan, Director,
Agricultural Representative Branch,
Department of Agriculture,
Toronto, Ont.

Mr. N. C. MacKay, Director,
Extension Service,
Department of Agriculture,
Winnipeg, Man.

Dr. W. R. Gunn, Director of Animal Industry,
Department of Agriculture,
Victoria, B.C.

Representing the Dominion Department of Agriculture.

Mr. G. B. Rothwell, Dominion Live Stock Commissioner,
Department of Agriculture,
Ottawa, Ont.

Mr. G. H. Clark, Dominion Seed Commissioner,
Department of Agriculture,
Ottawa, Ont.

Representing Business Institutions.

Mr. L. C. McOuat, General Agricultural Agent,
Canadian Pacific Railway,
Montreal, Que.

Mr. F. W. Walsh, Superintendent of Agriculture,
Canadian National Railways,
Montreal, Que.

At the meeting of the new board of directors, held on November 20th, Mr. R. S. Duncan was elected Chairman of the Council for 1932 and Dr. W. V. Longley was elected Vice-Chairman.

Shortly after the Royal Winter Fair,—on December 2nd, to be exact,—everyone interested in the boys' and girls' club movement was greatly pleased to learn of the very generous action of the International Harvester Company of Canada in making an endowmentment of $20,000 to the Canadian Council on Boys' and Girls' Club Work. This fund, which was established after the Company had communicated with the Honorable Robert Weir as to the manner in which the club movement might best be given assistance, is to be known as the "International Harvester Company of Canada, Limited, Endowment for Boys' and Girls' Club Work" and has been established in commemoration of the invention of the reaper by Cyrus Hall McCormick in 1831. It is the expressed desire and purpose of the International Harvester Company that the boys and girls of Canadian farms shall be aided in securing the benefits which they believe the Canadian Council on Boys' and Girls' Club Work can and will procure for them in the development of Canadian agriculture.

NOTES AND NEWS

M. P. Tullis, (Saskatchewan '16) formerly of the Saskatchewan Registered Seed Growers, Moose Jaw, is now located at Saskatoon representing the fertilizer interests of the Consolidated Mining and Smelting Company of Trail, B.C.

W. L. Jacobson (Alberta '20) has been transferred from the Department of the Interior, Irrigation Staff, Calgary, to the Dominion Experimental Station for Southern Alberta at Lethbridge, where he is doing irrigation work under the direction of Dr. W. H. Fairfield.

W. F. Hanna (Alberta '22) of the Dominion Rust Research Laboratory at Winnipeg, is taking further studies at Cornell University, Ithaca, N.Y.

W. J. Cowie (Toronto '31) is leaving for the Old Country and may be reached at the following address: West Grove, Menthyr, Tydfil, South Wales.

Roland Painchaud (Laval '23) has changed his address from Montmagny to Lambton, Frontenac Co., P.Q.

Dr. C. A. Zavitz (Toronto '88) has recovered sufficiently from his unfortunate accident to be able to make his usual winter trip to Florida. His address is: Apt. Five, Court Park, Second Avenue North, St. Petersburg, Florida.

P. D. Huxley (Alberta '31) has changed his address from Brooks, Alta., to 11011 University Avenue, Edmonton, Alta.

W. Timmermans (Montreal '27) has moved from Amos, P.Q., to Department of Agriculture, Plessisville, P.Q.

R. D. Sinclair (Alberta '18) returned some time ago from Scotland to the Department of Animal Husbandry, University of Alberta, Edmonton, Alta.

W. E. Walker (Saskatchewan '17) has changed his address from Rutland, Sask., to 1302 Avenue C North, Saskatoon.

Student Members give the following changes of address:

Jean Hardy, Department of Agriculture, Village Richelieu, Rouville Co., P.Q.
C. Shirriff, International Harvester Company, Edmonton, Alberta.
R. A. Fisher, 411 Lansdowne Avenue, Saskatoon, Sask.
G. E. Foucher, Berthierville, P.Q.
C. R. Hopper, 166 Leighton Avenue, East Kildonan, Winnipeg, Man.

The sympathy of members of the Society is extended to Mr. G. W. Muir (McGill '14), Acting Dominion Animal Husbandman, and Mrs. Muir, on the loss of their daughter, Margaret, after an illness of several months.

The sympathy of members of the Society is also extended to Mr. R. M. Lewis (Toronto '21), returned Agricultural Missionary from China, and Mrs. Lewis on the loss of their oldest son, Drew, through a motor accident while Mr. Lewis was attending Cornell University. The present address of the family is Slaterville Road, Ithaca, N.Y.